RAILROAD GAZETTE

FRIDAY, JUNE 15.

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Contributions.

When is a Locomotive Worn Out?

TO THE EDITOR OF THE RAILROAD GAZETTE:

I am a Superintendent of Motive Power of a large road possessing many locomotives of various ages. I wish to ask you and your readers who have studied the question, when they consider a locomotive should be "renewed." By this I mean, when is an engine unfit for further service and requires to be replaced by an entirely new engine? None of my engines are too light for some of our traffic, and my master mechanics consider that with a little patching here, and a few new parts there, the engines will run for many years yet. But I am not quite satisfied as to where this process ought to stop. What rule would your readers suggest? When an engine has done 15 years' heavy work, and wants serious repairs, would they break it up and buy or build an entirely new engine? Or would they put in an entirely new boiler, new valve motion, new rods, new axles and new tires and let her run a few years longer? I consider that then perhaps the cylinders, frames and wheel centres will be unfit for further service, and that the new boiler, etc., is rather wasted on old cylinders that will soon be worn out. But I confess I should like to have some definite rule to go by.

About 33 per cent. of my engines are over 15 years old, having been bought new between 1860 and 1871. Roughly speaking about 3 per cent. of my whole stock was bought in each year between those dates. If I buy or build three completely new engines for every hundred engines we now possess, am I keeping up my stock properly, or am I wasting money in patching old engines, when I ought to be building new engines with all the improvements that experience has shown are advisable? I observe that some of my neighbors don't even build their 3 per cent. of new engines, but I cannot believe that it is good policy to let old engines run too long, as they are very apt to fail on the road through some old flaw, and thus delay trains and cause inconvenience.

If any of your readers could give me the benefit of their practical experience on this point, and indicate what rate of renewals or what percentage of entirely new engines they have found will keep up their stock, I shall feel greatly obliged. I consider, of course, that the question greatly depends on the average and extreme age of the locomotives. A line that was first opened only 10 years ago would of course not have to consider this question just yet, while a comparatively old line like mine must face the fact that a number of its locomotives are very old and must soon be replaced.

I see several distinct methods of determining whether a locomotive should be replaced or repaired, but should like to hear from others which method they have found the best or whether they prefer a method that I have not named. One method is to replace any locomotive over a certain age, say 15 or 20 years. Another is to replace after a certain mileage. Another is to estimate the cost of necessary repairs, and replace if the figure (1) exceeds a certain amount or (2) a certain percentage of the original cost, or (3) of the present value of the engine or (4) of the cost of a similar but perfectly new engine.

Of course I am in all cases assuming that the old engines are not obsolete, and are sufficiently powerful when in good order to be of use.

Some exact figures or data as to what has been found satisfactory would be very acceptable. INQUIRER.

Railroad Taxation.

NEW YORK, June 12, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your article on "Railroad Tax Systems" (*Railroad Gazette*, June 8), you criticise one of my "notes" in the recent translation of Cossa's "Taxation." It is not for the purpose of traversing your criticism that I take the liberty to draw your attention to a distinction which seems to have escaped you in your own treatment of that plan of railroad taxation which takes for its basis the *stock and bonds* of the railroads. You say:

"But if you tax a corporation on the market value of stock *and* debt, you are taxing the property as a whole, and simply using the stock exchange valuation of its securities as furnishing, on the whole, by far the fairest means of estimating the true value of the whole."

Now, the point that I was considering was the proposed amendment of the Pennsylvania law, which amendment, as reported by the Tax Commission of that state, takes as a basis, not "the market value of the stock and debt," but the bonds (debt) at par and the stock at its actual value, which means, of course, its stock exchange value. Evidently this plan proceeds upon the assumption that the railroad company has in its possession a lot of property procured by borrowed money, and that the amount of *this* property is accurately measured by the outstanding bonds at par. It is immaterial whether the market value of the bonds is 50 or 150. The iron, the locomotives and cars, etc., to the par value of the bonds, are assumed to be on hand without enumeration. This I hold to be an objective tax.

On the other hand, the company is taxed subjectively on the value of its stock. This is presumed to show what the company is worth, what it would sell for, what it does sell for from day to day. May not this plan, then, be fairly called, in its totality, "a mixing together of objective and subjective taxes?" Possibly the phraseology employed by me in the "note" which you criticise was not as clear as it should have been, or as I have tried to make it here.

HORACE WHITE.

[We regret to have misunderstood Mr. White in this matter. As against the Pennsylvania system, his point is a good one. We were misled by his allusion to the Connecticut plan as not necessarily unjust, when he might have gone further, and have said that it avoids this confusion altogether. The state of things is somewhat curious. A tax on stock values is a subjective tax—a tax on what the *railroad company* is worth. A tax on stock and bond values is an objective tax—a tax on what the railroad is worth. We supposed that the Pennsylvania plan was a badly conceived attempt at the latter. Mr. White thinks it is a confusion between the two.—EDITOR RAILROAD GAZETTE.]

The Cost of the Change of Car Couplers.

TO THE EDITOR OF THE RAILROAD GAZETTE:

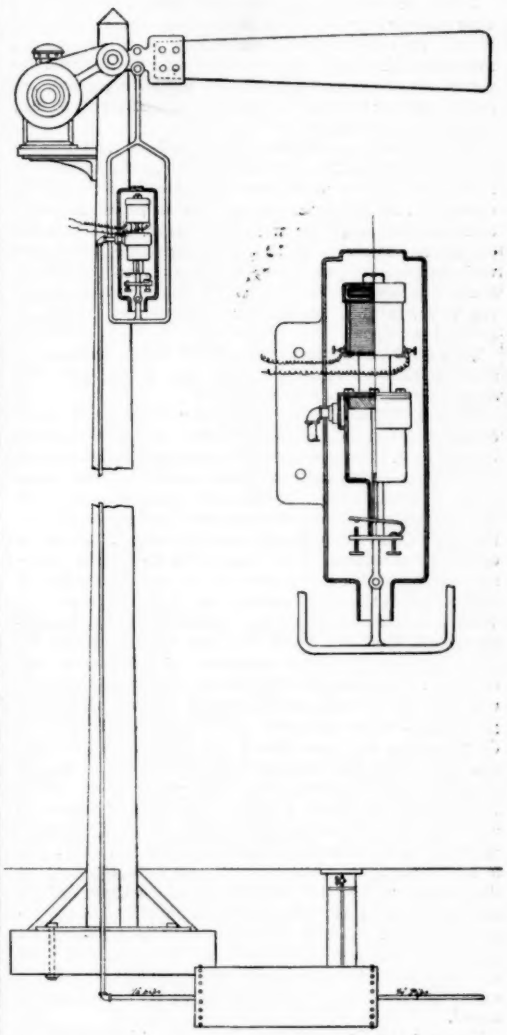
In the report of the meeting of the New York Railroad Club for May 17 I find certain figures given by Mr. Perry as representing the cost of changing from the link coupler to the M. C. B. coupler. He estimates the cost of changing a 20,000 car equipment in one year at $10,000,000, and $500,000,000 as the sum required to make the change in the *United States and Canada*. These figures are false and incorrect. I will take the cars in the United States as 1,000,000, which at $28.50 would cost $28,500,000 to change the entire equipment. Now suppose the link coupler to be of some value to the railroad companies, we will put them at $15 per car which will strike the average of an entire equipment of automatic link couplers, or $15,000,000 for the link equipment. The destruction of the cars and car trucks, the wrecks from broken links, the loss of pins and links, the death rate from free slack and going between the cars to place and replace the links, will reach over $32,000,000 annually, with the use of pins and links, and the M. C. B. coupler is a good deal the cheapest. To be liberal with the link and pin brothers, we will put the cost of equipping 1,000,000 cars at $15,000,000. But $22,000,000 will supply a vertical plane coupler with 10 per cent better service than the link and pin, to say nothing of the saving in cars and the life of trainmen. The difference is $7,000,000 for 1,000,000 cars, or $3,000,000 less than what Mr. Perry would like to make railroad people believe is the cost of equipping 20,000 cars. Figures won't lie if you use them correctly. A. W. VAN DORSTON.

Automatic Signals on the Fitchburg Railroad.

The Fitchburg was the first to adopt the Union rail circuit signals for any except experimental purposes. Ten miles of this road were equipped with the old style instruments of this system about 1879, and gradual extensions have been made since that time. The arrangement of batteries, relays, etc., for these signals is exactly like that described in the article on "Automatic Signals on the Boston & Albany" in the *Railroad Gazette* for June 24, 1887; that is, at the end of the section farthest from the signal is placed a battery having its poles connected, one to each rail, while at the end nearest the signal is a relay with its coils connected in like manner, one pole to each rail. This relay opens and closes the circuit of a local battery which governs the movements of the signal. The only difference between the two systems is in the form of the signal—which is here a semaphore arm—and the motive power, which is compressed air moving a piston in a closed cylinder. Each signal is placed about 200 feet from the beginning of the section in order that the engineers may see them operate, and is provided with an overlapping circuit of about 1,000 feet in length, as described for the system referred to.

In 1883 twelve miles of the east-bound track on a 60-ft. grade from Ashburnham to Fitchburg were equipped with electro-pneumatic semaphores by the Union Switch & Signal Company. The sections are about a mile in length. The general appearance of the signal is shown by fig. 1. At the top of an iron post about 24 ft. high is placed the semaphore arm, which moves about 60 deg. in a vertical plane in the ordinary manner. The arm itself, however, instead of being connected to a distant lever, is attached to a rod about 3 ft. long which ends in a yoke or stirrup. In the yoke is a box containing an electro-magnet and a closed cylinder, fixed to the iron post, within which works a piston actuated by compressed air. The section of this cylinder is shown in fig. 2. The air is supplied through a feed-pipe *P*. The valve admitting it to the cylinder is controlled by an electro-magnet which is so arranged that when the current circulates in the coils the armature is attracted and the valve is held open, admitting the air to the cylinder. This drives the piston before it to the bottom and brings down the blade. When for any cause the current is interupted, the valve closes, an exhaust is opened, and the air escapes; a counter-weight brings the signal to danger.

Below and in front of the piston rod is seen an electric circuit



Electro-Pneumatic Block Signal, Fitchburg Railroad.

closer attached to a small spindle, independent of the piston rod, but which is operated by the piston itself when its own movement towards the bottom of the cylinder is nearly completed. This is so adjusted as to keep the auxiliary circuit which it governs closed whenever the signal is all clear, conveying the indication of this fact to any desired distance; it may also be arranged to ring a bell or give other warning whenever the signal shows danger. The movement of the circuit closing device is made to depend on that of the piston in such a manner that the completed movement of the piston [and so of the signal] must take place before the auxiliary circuit will be closed (or opened as the case may be). On the Fitchburg this is made use of only in the case of a few special signals: to ring a bell at certain switches from which the signal cannot be seen: to warn switchmen when a train has entered the section.

The compressed air at 60 lbs. pressure is supplied by a pump located at Fitchburg. This pump is automatic, and similar in principle to that employed for the Westinghouse air brake. The air passes first through a coil of pipe to cool it, thence into a reservoir, with which is connected a blow-off cock to remove the condensed water. The air from this reservoir passes into a 1-in. pipe running between the tracks about 1½ ft. below the surface. At bridges, etc., where it comes to the surface, expansion and contraction are provided for by a long bend or a round turn in the pipe. At each signal a ¼-in. branch is connected with the main pipe. This leads to a reservoir at the bottom of the post, which holds air enough to operate the signal about a dozen times. There is a stop-cock in this branch, which can be closed should occasion require. Stop-cocks are also inserted in the main pipe about every half mile for the purpose of locating and confining any trouble with the main pipe to a small section, so that only one, or at most a few signals need be affected. From the reservoir at

the bottom of the post a ½ in. pipe runs to the air cylinder operating the signal, and when the valve is open the pressure brings the signal clear. The electromagnet is in the circuit of a local battery which is controlled by a relay, the coils of which are connected to the rails as in the clockwork signals. When a train enters the section this relay opens the local circuit, the armature of the signal magnet falls off, and closes the valve leading to the cylinder and opens an exhaust. The air escapes and the signal arm takes a horizontal position until the section is clear. The same thing happens if the batteries fail, or a wire or rail breaks. Duplicate pumping apparatus is located at the other end of the grade (Ashburnham), so that in case of accident or repairs to the pump at Fitchburg, or a break in the main pipe the signals can be worked from the other end as far as the break, for an indefinite time. The air in the auxiliary reservoirs at the signal posts is also sufficient for a number of operations.

It is not necessary to run the pump for these signals more than three or four hours per day, and as much during the night. The regular work of the engineer is to run hoisting machinery for a coal dump; in addition to this, he runs the pump for the signals occasionally until the air pressure reaches 60 lbs.; then he stops until it falls to about 40 lbs., when he pumps again.

The number of operations of these signals for two months in 1887 was 48,487, or about 795 per day. The number of failures in the same period was 133, or one failure to 365 operations; 22 disk signals during the same period made 69,844 operations, and there were 54 failures, or one in 1,293 operations. The cost of 12 electro-pneumatic semaphores with the necessary pumping apparatus, etc., was $11,126, or $927.17 per signal. The cost of 14 disk signals erected by the writer in 1887 for another railroad was $6,971, or $497.94 per signal.

The cost of maintenance of the electro-pneumatic signals is about $133.33 per signal per year; that of clockwork disc signals, about $75 per year each signal.

The application of these signals in a considerably more complicated form was made on 13 miles of the West Shore road in 1884. The same system was applied to short sections of the Pennsylvania and some other roads about the same time. In this arrangement each block signal was provided with a distant signal at the beginning of the preceding section, so that there were on each post two signals, the upper of which was painted red and referred to the section beginning at the signal, and the lower, which was green and cut with a dovetailed end, belonged to the section second in advance of where the signal stood. Each block signal was connected with its distant signal by a wire circuit, so that the latter reproduced all the movements of the former. Besides this, each red signal when in the danger position was caused to close a shunt circuit around the magnet of the green signal on the same post, so that the latter also stood at danger as long as a train was in the section. There were thus three signals at danger behind a train, two at the beginning of the section where the train was and one at the beginning of the preceding section. They were lighted at night by lamps which showed red when the signals were in the stop position and green for all clear. If a train found the two arms on any post standing at danger, or two red lights at night, it would indicate that the section beginning at the post was obstructed, while the upper arm inclined and the lower one horizontal (or at night a green light with a red one below it) would mean that the section immediately in advance was clear, but a train or other obstruction must be looked for on the second section ahead.

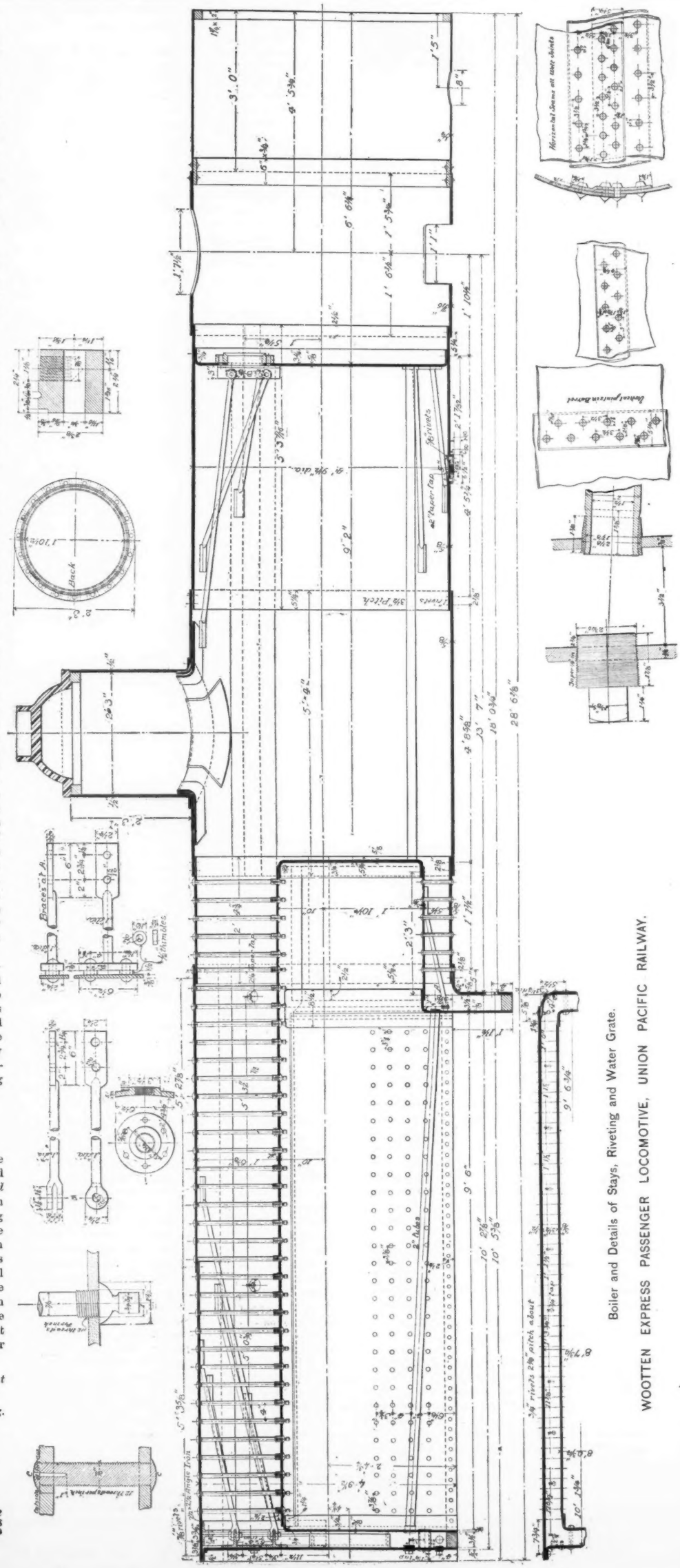
This was the first extensive application of electro-pneumatic semaphores put up by the Union Switch & Signal Company, and they were then without that knowledge of the proper methods of construction and operation which has been since gained by experience. Partly from this cause, and partly, it is claimed, because the road was new and the settlement and displacement of the road-bed caused many leaks in the pipes, this system never gave complete satisfaction, and has now been discontinued, the semaphores being worked by signalmen and without distant signals.

Variable Exhaust Damper.

Mr. H. A. Luttgens' arrangement of a damper at the base of the locomotive smoke-stack, through which air is admitted in any volume desired, was illustrated in the *Railroad Gazette* for Oct. 1, 1886. Twenty-seven locomotives on the Kansas City, Ft. Scott & Gulf road, eight on the Long Island and many on other roads have been fitted with the damper. A number of reports have been furnished us from master mechanics and enginemen giving individual opinions and estimates that the use of the damper effects a substantial saving of coal; protects the flues from cold air, because there is no need of running with the furnace-door open; and, in the language of one of the engineers, "is a comfort to the engineer and fireman." Mr. A. Griggs, Superintendent Locomotive and Car Department, Providence & Worcester Railroad, sends the following record:

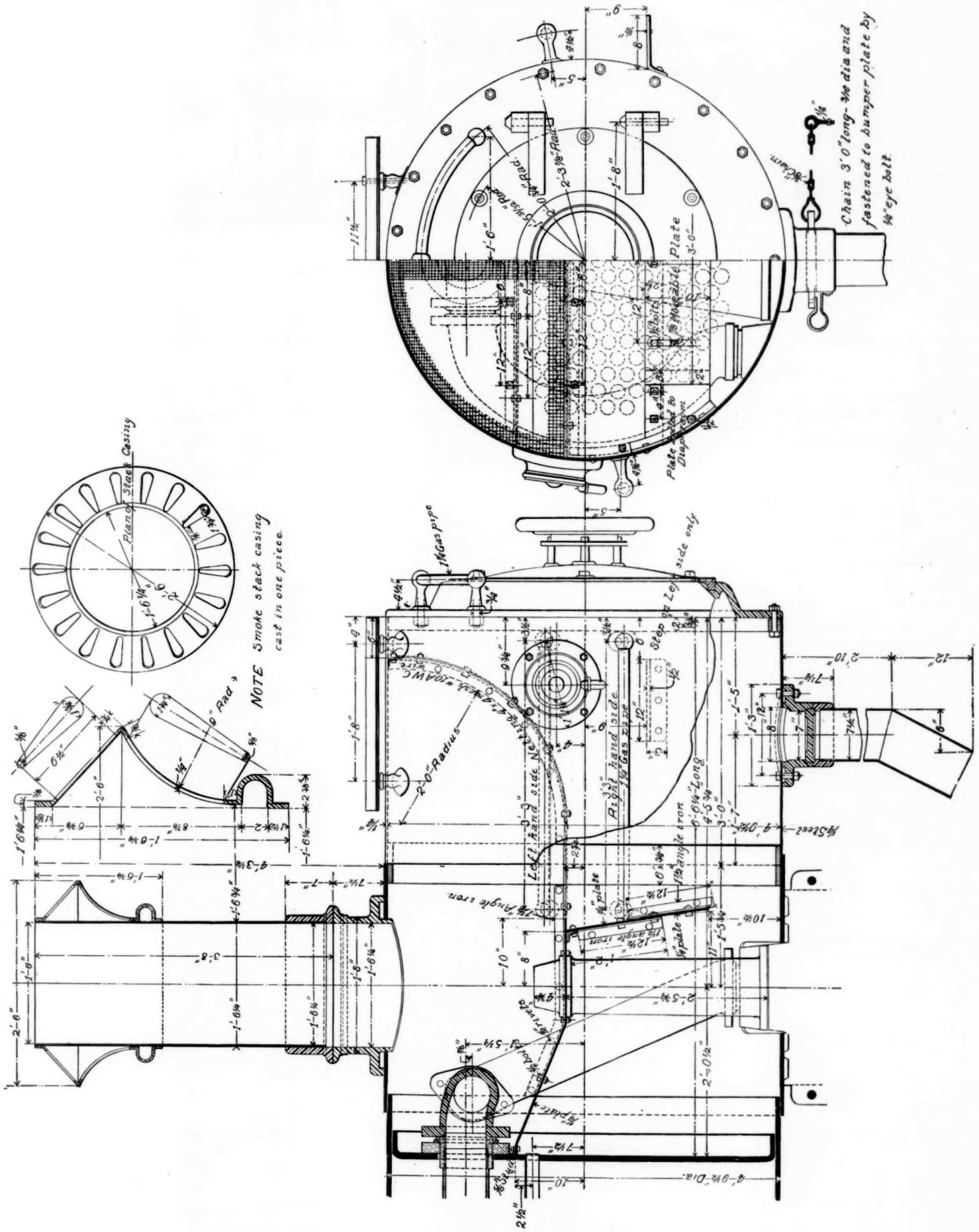
Coal Test With Engine No. 15, with H. A. Luttgens' Patent Register Damper, from April 23 to 30, 1888.

Date.	Coal taken. Lbs.	Mileage. Pass.	Switching.
April 23	6,775	90	32
" 24	4,699	90	21
" 25	4,014	90	32
" 26	4,440	90	34
" 27	4,057	90	32
" 28	1,346	90	29
	25,331	540	190
Total miles run			730
Miles run per ton of coal			63.42
Lbs. coal per mile			34.68
Lbs. coal per car mile			12.79



Boiler and Details of Stays, Riveting and Water Grate.

WOOTTEN EXPRESS PASSENGER LOCOMOTIVE, UNION PACIFIC RAILWAY.


Chain 3'0" long- 3/4 dia and fastened to bumper plate by 3/4 eye bolt
Plate
Plan of Stack Casing
NOTE Smoke stack casing cast in one piece.
Left hand side Netting
Right hand side Gas Pipe
Step on Left side only
2'-0" Radius
Details of Extended Smoke-box and Stack.

WOOTTEN EXPRESS PASSENGER LOCOMOTIVE, UNION PACIFIC RAILWAY.

Engine No. 15. *without Damper, from April* 30 *to May* 7, 1888.

Date.	Coal taken. Lbs.	Mileage. Pass.	Switching.
April 30	5,862	90	33
May 1	6,125	90	32
" 2	4,477	90	35
" 3	4,344	90	35
" 4	4,610	90	32
" 5	3,083	90	31
	28,501	540	198
Total miles run			738
Miles run to 1 ton coal			56.94
Lbs. coal per mile			38.64
Lbs. coal per car mile			14.72
Lbs. coal per car mile less with damper			1.93

Mr. Griggs adds to his report: "It needs only a fair trial to convince any master mechanic of its value, both in saving uel and in cleanness of engine."

Wootten Express Engines, Union Pacific Railway.

The accompaning illustrations represent a class of locomotives, with Wootten fire-box, built by the Rogers Locomotive Works, of Paterson, N. J., for the Union Pacific Railway, from the designs of Mr. Clement Hackney, Superintendent of Motive Power of that line.

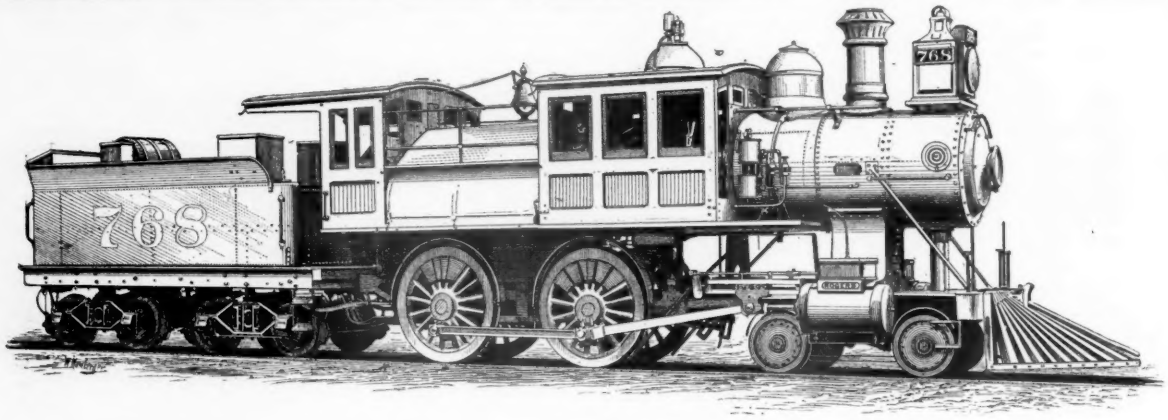
It will be seen from the prospective view of the engine and tender that these engines have two cabs, and that the fireman is more efficiently sheltered from the weather than is usual on Wootten engines. The severe climate of Nebraska and Wyoming necessitates a very efficient protection for the men working the engines, and the arrangement shown is found to answer well. Canvas screens are used on each side f the hind cab during blizzards and severe weather.

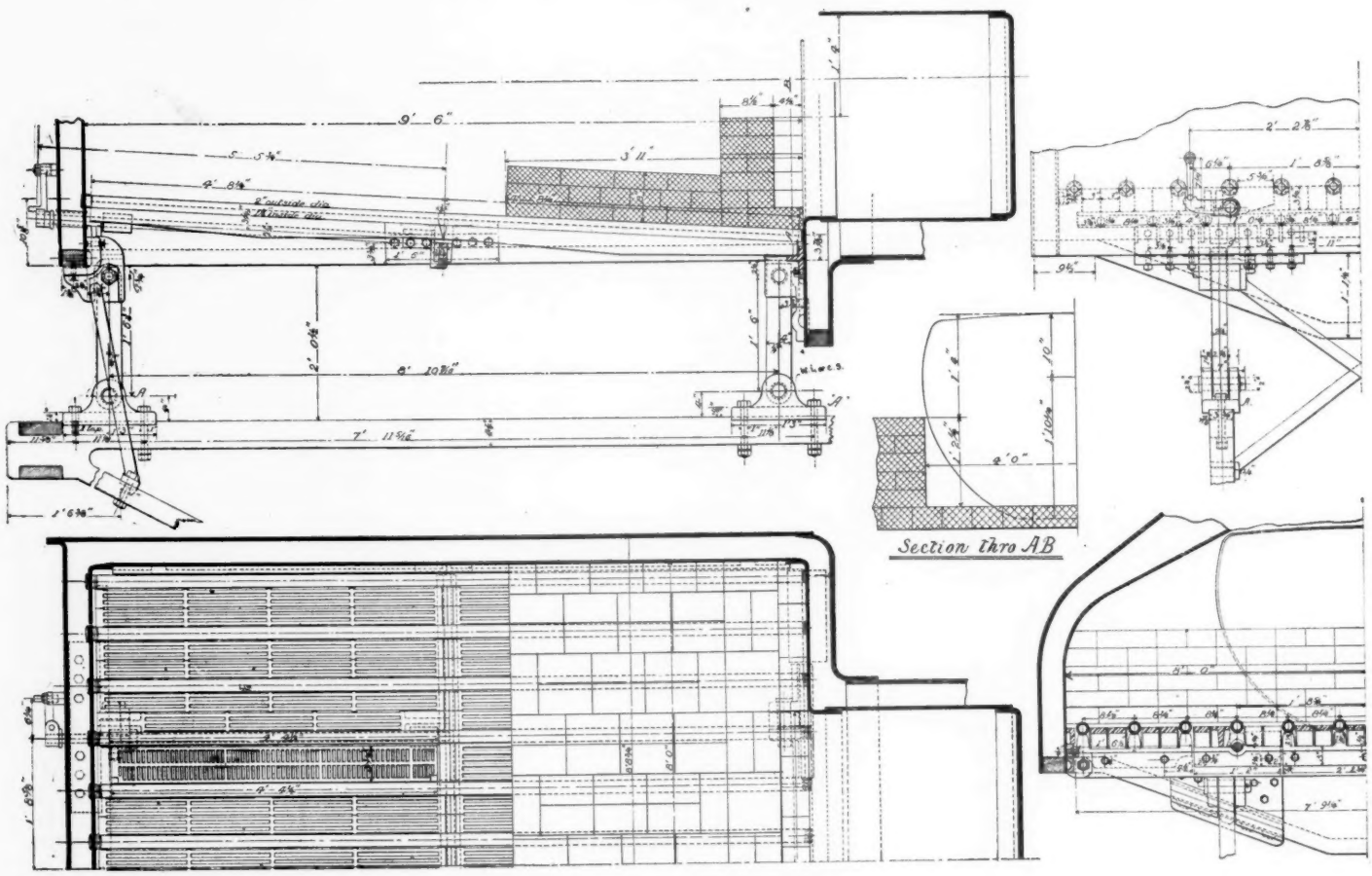
The handsome appearance of the engines is also obvious, and shows a considerable improvement on former designs.

The arrangement of the grate, which also posessses many novel features, is very clearly shown in the detailed drawings. The grate is composed of twelve water tubes 2 in. outside diameter and 1½ in. inside diameter. The manner of setting the water tubes is clearly shown on an enlarged scale.

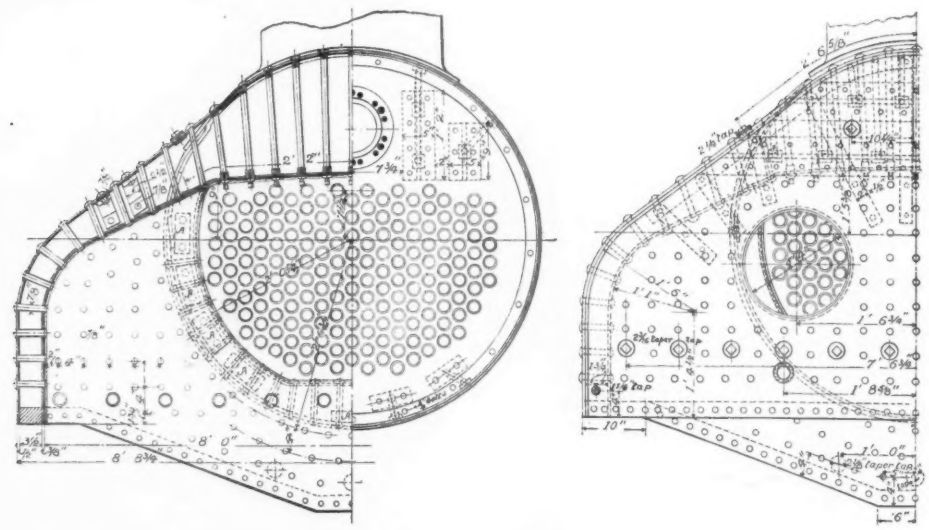
There are two drop grates in the grate. The space between the water tubes is filled up with fine cast iron grate, which is also shown in detail. The ribs are ⅝ in. wide, and the air spaces are also ⅝ in. wide. A finer opening has been tried, but did not give such good results as the ⅝ in. openings.

It will be seen from the engraving that a large part of





Arrangement of Fire-box, Etc.

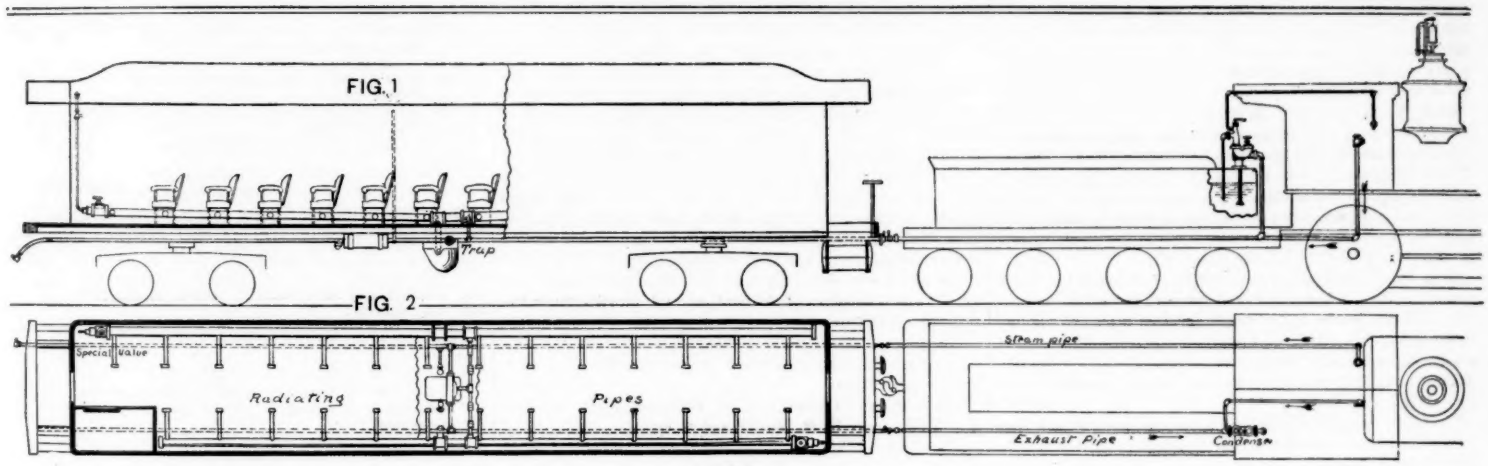


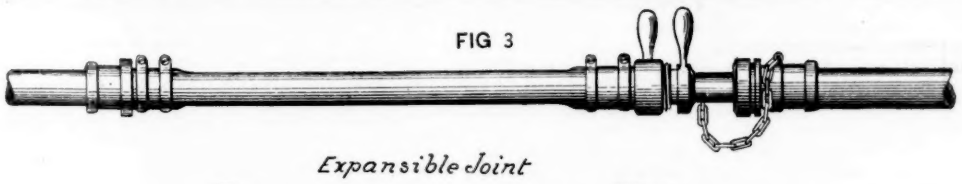
EXPRESS PASSENGER LOCOMOTIVE, WITH WOOTTEN FIRE-BOX, UNION PACIFIC RAILWAY.

Designed by MR. CLEMENT HACKNEY, *Supt. Motive Power. Built by the* ROGERS LOCOMOTIVE WORKS, *Paterson, N. J.*

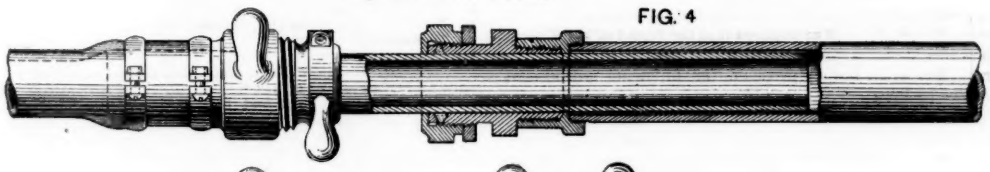
the grate is covered with fire-brick. The form of the brick arch or wall is clearly shown in the cross section through the line *A B*. It is well known that the exact form of this wall and its distance from the tube sheet are very essential points in the design of a Wootten fire-box, and that much of the success of the engines in burning fine coal or slack depends upon the proportions adopted for the brick arch or wall. These engines burn nothing but fine slack, and make steam very freely and haul the heavy express trains of the Union Pacific at a higher rate of speed than has been before attained on that road. The coal used is taken from the mines owned by the railroad, and is bituminous, though light in its character. It is, however, successfully burnt without any sparks, a result probably due to the enormous grate area, while the heat radiated from the large mass of fire-bricks maintains an even temperature in the fire-box and insures tolerably complete combustion. The large area of the grate prevents any appreciable lifting of the fire, and the small pieces of live coal that are sucked up by the blast are burnt on their way to the flues owing to the high temperature maintained by the brick arch or wall.

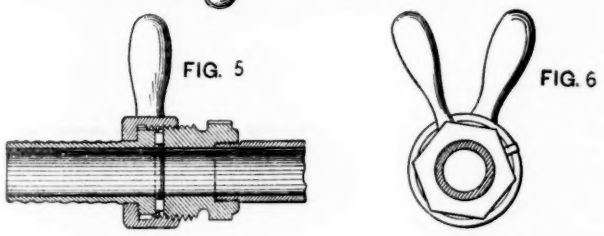
The arrangement of the extended front, etc., is also clearly shown in the illustrations. It will be observed that the chimney top has an ornamental appearance. The inside is smooth and cylindrical. The method of staying, riveting, etc., are clearly shown in the engravings. All the seams in the fire-box have 2½ in. lap, and are single riveted with ¾-in. rivets placed at 2 in. pitch. All the fire-box stays are drilled as shown from the outside, so that a fractured stay can be easily detected. The holes are ⅛ in. dia. and 1 in. deep. The tubes are copper ferruled, rolled and bended at fire-box end and are copper ferruled and rolled at smoke-box end.

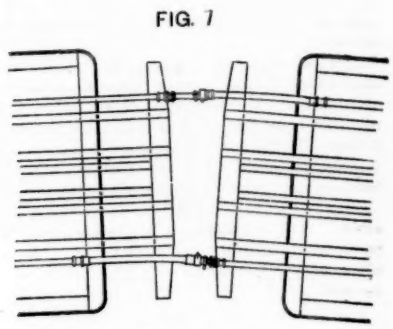




Expansible Joint







Action of Joint on curves.

CONTINUOUS STEAM HEATING SYSTEM—STANDARD CAR HEATING & VENTILATING CO.

The driving axles are 7½ in. diameter in the centre, 8 in. in the bearings, and 7¾ in. in the wheels. The bearing surfaces are ample throughout, the driving journals being 12 in. long and the eccentric sheaves 3½ in. wide. The main crank pins are 4½ in. by 4½ in.

Further illustrations of the details of these fine engines will be in given in a future issue.

The principal dimensions of the engines are as follows:

Cylinders, diameter and stroke	18 × 26 in.
Driving wheels, diameter on tread	63 in.
Truck wheels, " " "	30 in.
Wheels base, rigid	7 ft. 6 in.
truck	6 ft. 3 in.
Total	22 ft. 5½ in.
Boiler, diameter inside, smallest course	56¼ in.
Flues, length	9 ft. 2 in.
" diameter outside	2 in.
" centres	2¾ in.
" number	172
Dry-pipe, internal diameter	7½ in.
Fire-box, length inside	9 ft. 6 in.
" width "	8 ft. 0 in.
Heating surface flues	825 sq. ft.
" " fire-box	175 sq. ft.
Total	1,000 sq. ft.
Grate area	76 sq. ft.
Boiler pressure per sq. in	160 lbs.
Weight in working order	lbs.
" drivers	76,500 lbs.
" truck	42,000 lbs.
Total	118,500 lbs.
Weight, tender, empty	32,000 lbs.
" water, 2,900 gallons	24,167 lbs.
" coal	11,200 lbs.
Total	67,367 lbs.
Total, engine and tender	185,867 lbs.
Tractive force per lb., average pressure in cylinders	132.1 lbs.
Tractive force when average pressure in cylinders equals .85 boiler pressure = 132.1 × 136 =	17,965 lbs.
Co-efficient of adhesion or $\frac{\text{Maximum tractive force}}{\text{Weight on drivers}} =$	$\frac{1}{4.26}$

Continuous Heating—System of the Standard Car Heating & Ventilating Co.

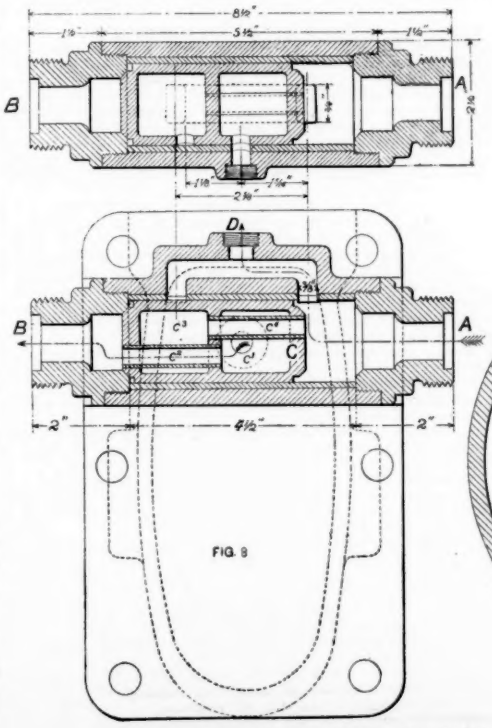
The illustrations given herewith show the system of continuous heating which the Standard Car Heating & Ventilating Co., of Pittsburgh, has developed, and which has been in regular service for some months. As is well known, that company has for some time made and applied a steam heating system by means of a boiler suspended under the car. For the last year and a half the company has given attention to the subject of continuous steam heating, and has endeavored in the construction of the apparatus that it is now using to provide for a wide range of temperature in the car, and the automatic regulation of the temperature of the car, and also for the return of the water of condensation to the locomotive, not only to save the water and heat, but also to prevent water dripping upon the tracks and platforms in stations, where the formation of ice might be the cause of accidents to passengers, for which the railroad companies would, of course, be liable.

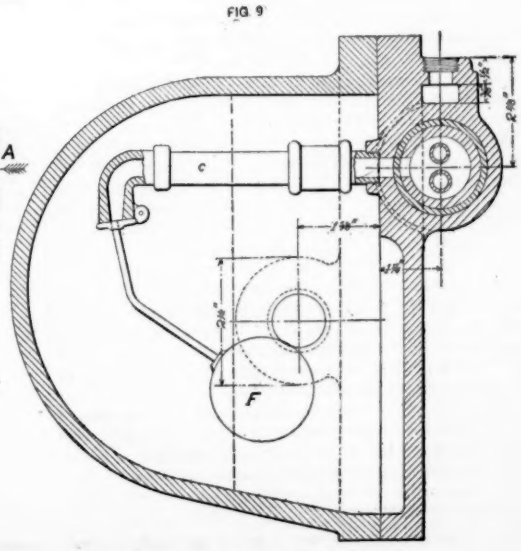
The return of the water of condensation to the locomotive necessitates the use of a double line of pipe; and taking advantage of the knowledge and experience gained in brake matters, Mr. Westinghouse has devised an arrangement of pipes and valves whereby one pipe will always serve to convey the steam to the car, and the other to return the water to the tender, provision being made for the turning of the cars end for end by the use of an automatic valve which makes the required changes in the ports and passages of the apparatus.

Figs. 1 and 2 represent an elevation and plan of a car and tender and a portion of the locomotive. Fig. 3 is an outside view of one of the connections between the cars; fig. 4 the same in enlarged view, part in section; fig. 5, a section of the coupling; fig. 6, an end view of the same; fig. 7, a diagram showing the position and action of the connection between the cars when the train is on a curve; and figs. 8, 9 and 10 show the construction of the trap and valve device which is interposed between the two lines of train pipe, one of the train lines being connected at *A* and the other at *B*, as shown in figs. 8 and 10. The valve device used is clearly shown in figs. 8 and 10. A piston *C* slides backwards and forwards in a brass lined cylinder. In the position shown, steam enters by the pipe *A*, and the piston *C* is forced to its left-hand position, opening a passage, as indicated by the arrow, to *D*, which is in communication with the system of pipes within the car.

By referring to fig. 9 it will be seen that the trap is provided with a little float *F*, controlling a passage into a pipe *c*, which by a suitable opening in the valve *C* empties into the chamber c^1, and by a pipe c^2 passes, as indicated by the arrow, through the opening *D* to the return pipe. When the car is turned end for end so that the steam enters at *B* instead of at *A* the piston *C* shifts to the right-hand opening, reversing the connections so that the float *F* will discharge the water by the chamber c^3 and pipe c^4 to the opening *A*. By referring to figs. 1 and 2 the location of the trap will be clearly seen.

The pipes inside of the car are 2½ in. in diameter, and have a connection from the opening *D* previously referred to:





IMPROVED STEAM TRAP—STANDARD CAR HEATING & VENTILATING CO.

but instead of emptying directly into the pipe in the centre of the car, a ¾-in. pipe is carried into and through the 2½-in. pipe to a valve arrangement shown at *d*, fig. 1, which is provided with an ordinary stop-valve, which may be opened or closed. When it is closed the steam in the interior of the pipe produces a moderate degree of warmth, only, in the 2½-in. pipe; but when opened the steam flows through the passage *D* into the ¾-in. pipe to the valve *d*, thence into the large pipe, and by a suitable return pipe empties into the trap beneath its cover, and when the height of water is sufficient to open the valve controlled by the float *F*, the water returns by the return pipe to the locomotive.

G on the locomotive, as shown in fig. 1, represents a steam ejector. Steam admitted by the pipe *g*, acting in connection with the water in the tender, creates a partial vacuum in the return train pipe, and constantly delivers the water of condensation into the tender, where all remaining heat is utilized in raising the temperature of the feed water of the locomotive.

The valve device *d* of each car is also provided with a second valve which is opened by the admission of air pressure. *f* indicates a thermostat, having a connection with the auxiliary reservoir of the brake apparatus and with the valve *d*. When the temperature of the car is below the normal, air is admitted by the thermostat to act upon the piston in valve *d* and thus opens a passage from the ¾ in. to the 2½ in. pipe, and when the temperature of the car is above the normal, the pressure upon this piston is released, and the steam to the 2½ in. pipe is cut off.

By referring to figs. 3 and 4, the connection between the cars will be fully understood. A stiff rubber hose provided with a wire coil is used in connection with a slip joint, the slip joint being limited in its motion for ordinary purposes by a chain. In the event of the train breaking in two, however, a link of the chain yields and the slip joint parts. It has been found in practice that this joint keeps perfectly steam-tight, and that the shortest curves are provided for, and inasmuch as the connection is in a straight line with the pipe, no pockets are left for the trapping of water, and the difficulty heretofore experienced in the return of the water to the tender on long trains is entirely overcome.

The apparatus has an obvious advantage in that, two lines of pipe being used, in the event of an accident to one of these pipes the other may be used for the conveyance of steam to the cars, the water of condensation being discharged upon the ground, as is commonly done in the systems having only a single line of pipe.

The Master Car-Builders' Convention.

The M. C. B. Association held its annual meeting at Alexandria Bay, N. Y., in the Thousand Islands. The convention held the first sitting on Tuesday morning, June 12. The weather was fine and pleasant and the attendance was large.

The meeting having been called to order, and the calling of the roll and the reading of the minutes having been dispensed with, the President, Mr. W. McWood (Grand Trunk), delivered an opening address:

The growing interest in the interchange of opinions regarding mechanical points in the construction and interchange of cars was a marked feature of recent years. The discussions at local master car-builders' clubs, which had been lately established at various points, added much to the interest of the annual gathering and contributed to the valuable results achieved. He reminded the members that the action taken at these annual meetings did something to make history and certainly contributed to advance the prosperity of the American continent. He asked for the earnest consideration of the members for the work before the Association, and trusted that they would discuss the various subjects with the clear purpose of arriving at definite conclusions.

Though finality cannot be attained, and the march of improvement necessitates frequent modifications in railroad appliances, the attainment of the greatest possible degree of uniformity is very important. The value of some standards is impaired by the fact that absolute and exact uniformity has not been attained. In order to secure standard patterns which are exactly correct, they should emanate from one point. This deserved the best consideration of the Association The independence of thought and action which is natural to man and essential to progress somewhat hindered uniformity, but individual differences could be confined within proper limits, and defining present attainments does not hinder progress.

Amongst the work before the Association was the further revision of the Rules of Interchange, with a view of making their meaning perfectly clear.

He stated that the Association could be congratulated on the work achieved during the last year, and might well feel proud of the elaborate investigation shown in the Report of the Brake Committee. Mr. McWood concluded by hoping that this convention would not fall behind others in interest.

Mr. D. H. Neale, Mechanical Editor of the *Railroad Gazette;* Mr. C. A. Park, Carriage Superintendent of the London & Northwestern, having sole charge of 8113 passenger cars, and Mr. F. W. Webb, Mechanical Engineer of the same line, having sole charge of 2323 locomotives, were then unanimously elected associate members. The nomination of Mr. W. J. Hayes, of Cincinnati, was then withdrawn, as that gentleman is now eligible as a regular member.

The Secretary then read his annual report, which showed that the Association had sustained a slight numerical loss of members, though the number of cars represented in the association exhibited a considerable increase, as shown below:

1886	580,084 cars.
1887	689,555 cars.
1888	over 700,000 cars.

The annual accounts showed a deficit of nearly $1,000 owing chiefly to the increased cost of the annual report due to the publication of the Brake Committee's Report. He anticipated, however, that the deficit could be more than met by the income of the present year, and that there was no necessity of increasing the annual assessment. As compared with the previous year, the income had increased $1,284, while the expenses had increased $1,460. The expenses for the next year would probably, with due economy, show a considerable decrease, while the receipts would, owing to the greater number of cars represented, show an increase, and thus would enable them to extinguish the deficit and show a favorable balance. The total receipts amounted to $4,771.

The Secretary suggested that the Executive Committee should select the place of the next annual meeting from the three places that receive the highest number of votes in the Convention. The report of the Secretary was received.

The President then announced the membership of the following committees:

Nomination of Officers.—B. K. Verbryck, J. W. Marden, G. W. Demarest, N. M. Martin and S. Irvin.

Subjects to be Reported on at the Next Convention.—J. N. Barr, G. W. Ettinger, J. D. McIlwain.

Correspondence and Resolutions.—J. S. Lentz, C. A. Smith, Thomas Sutherland.

Place for Next Meeting.—George Hackney and H. Middleton.

Auditing Committee.—Robert Miller, John MacKenzie, E. Chamberlin.

The Secretary reported that the Central Traffic Association had arrived at no definite resolution in regard to reduced rates for those attending the Convention.

Mr. E. B. Wall announced that the report of the Executive Committee on couplers would be postponed till Thursday.

Mr. M. N. Forney proposed the following amendment to the by-laws:

Places for holding the next annual meeting may be proposed at any regular meeting of the Association. Within six months thereafter a committee of three shall select one of the three places receiving the highest number of votes. The motion was carried after some discussion.

Mr. E. B. Wall then gave notice of an amendment to the Constitution as regards the qualification of associate members. This amendment will enable them to continue as members when they are unable to attend the annual meeting for three consecutive years, which non-attendance at present disqualifies them for further membership. Mr. Wall explained that this condition was oppressive to foreign members, who might contribute valuable results to the Association's investigations, but would be unable to attend the meetings.

The Report on Standard Appliances for Safety of Trainmen was then read:

REPORT OF THE COMMITTEE ON STANDARDS AND APPLIANCES FOR THE SAFETY OF TRAINMEN.

At the last Annual Convention your "committee was instructed to report some definite recommendations next year." With the end in view for which the Committee was appointed, and to comply with the above instructions, they prepared and issued the following circular:

MASTER CAR-BUILDERS' ASSOCIATION—CIRCULAR OF INQUIRY.

From the Committee on Standards and Appliances for the Safety of Trainmen.

NEW YORK, April 8, 1888.

The Railroad Commissioners of the state of New York report that during the year ending Sept. 30, 1887, there were 199 railroad employés killed and 896 more or less severely injured, in the performance of their duties. These accidents are classified as follows:

	Killed.	Injured.
Fell from train, engine or cars, or getting on or off trains	48	152
Striking low bridges, switches, tunnels, etc.	8	9
Coupling or uncoupling cars	20	437
Walking or being on track	102	88
Catching foot in frog or between rails	4	7
Derailment	1	19
Collisions	6	40
Other causes	10	144
	199	896

According to Poor's Manual the number of locomotives owned by railroads in the state of New York in 1886 was 2,722, and in the whole country 26,415. It will be quite safe to say that there were ten times as many locomotives in the whole country as there were in New York State during the period covered by the Railroad Commissioners' report. If the average number of persons killed and injured per locomotive is the same elsewhere, the number of casualties to railroad employés in the whole country would be ten times the above figures, or a total in round numbers of 2,000 killed and 9,000 injured.

No pretense is made that this estimate gives the employés killed and injured with anything more than an approximation to accuracy. It must be remembered, though, that whatever errors there may be in the reports of accidents to the Railroad Commissioners, and of the number of locomotives in the country, are errors of omission, and that probably both the number of accidents and of locomotives are greater than reported, which would make the above estimate too low rather than too high. Nevertheless, with any reasonable deduction the record of frightful suffering, pain and sorrow will be more than sufficient to emphasize the following inquiries, the aim of which is to elicit information that will indicate how the number of such accidents may be diminished.

All railroad officers and employés, whether members of the Master Car-Builders' Association or not, are therefore requested to answer the following questions:

1. What defects are there in the present construction of cars and locomotives which cause accidents to railroad employés by falling from trains, engines or cars, or of accidents in getting on or off trains?
2. What changes could be made in cars or locomotives which would diminish the number of such accidents?
3. What kind of couplers and dead-blocks are the most dangerous to employés in coupling cars?
4. What kind of coupler and dead-blocks do you think is the least dangerous to employés?
5. Has the introduction of automatic couplers thus far lessened the danger of coupling cars?
6. Would the general introduction of automatic couplers in your opinion diminish the danger of coupling cars?
7. Can you suggest any way of lessening the number of accidents to employés from "walking or being on the track?"
8. How can employés be prevented from "catching their feet in frogs or between rails?"
9. In what way may any other kinds of accidents to employés be prevented or the number lessened?

All railroad officers and employés, who see this circular, are earnestly solicited to answer it, and thus add the weight of their testimony in helping to reduce the terrible sacrifice of life and limb, which is annually exacted from our railroad employés.

JOHN KIRBY, M. N. FORNEY, } Committee.

To the first question: "What defects are there in the present construction of cars and locomotives which cause accidents to railroad employés by falling from trains, engines or cars, or of accidents in getting on or off trains?"

To this question five members have answered that they do not know of any such defects. Other members name the following defects:

"Draw-bars, train slack and the jerk consequent thereto is the cause of the largest number of men falling from moving trains."

"Insufficient or inferior running boards."

"The absence of a safety rail on the eaves of house cars."

"The absence of means to get over coal cars and from one car to another."

"Insufficient and poorly constructed ladders and steps."

"Defective brake apparatus."

"Freight cars and trains need power brakes and close couplers, slack and links and pins must be abandoned; they are the primary cause of men falling from freight trains."

"Cars too far apart."

"Too much slack in couplings."

"Steps too high and small, and no steps."

"Irregularity in construction."

"On a great majority of cars running to-day the handles, ladders and steps are not as strongly secured as they should be."

"No protection from falling from roofs."

"Faulty brakes."

"Loose or broken ladder rounds."

"Ladders on side of car."

"Poor inspection."

"The ladders, steps, hand-holds, and brakes on top of cars are all causes of loss of life."

"Steps too high, steps and ladders insufficiently secured, unequal height of cars. Too great distance between cars."

In their reply to the Committee's circular Messrs. Godfrey W. Rhodes and William Forsyth, of the Chicago, Burlington & Quincy Railroad, say:

"We have to-day had a meeting with some half dozen of our old experienced freight conductors, and as a result of this meeting reply to your first question as follows:

"The main faults which occur from falling in getting on and off trains is on account of improper foot rests and hand rests on the engine. Couplings have to be made from the pilot to the rear of the car. On many roads no provision is made for proper foot rests on the pilot. It is essential in train service for trainmen to get on and off cars while the train is moving. Many cars have the steps parallel with the ends, instead of with the sides, and in some cases where the steps are parallel with the sides, the hand grab iron is placed in a perpendicular position in place of a horizontal position. In getting on to a car so arranged there is great danger of the brakemen being swung underneath the car. The foot steps should always be parallel with the side of the car and the grab iron also parallel. Hand grab irons on the roof are also often placed in a diagonal position, so that it is difficult for a man on the roof to tell whether the steps are down on the side of the car or the end. In some cases the roof grab iron is placed in a still worse position, viz., parallel with the sides of the car, whereas the ladder is located on the end of the car. The result of such a location is that a trainman who is not familiar with the car, wishing to go down from the roof of such a car, is apt to go down the side in place of down the end. Our men cited several instances of accidents and narrow escapes from these causes. The roof grab iron should always be parallel with the ladder."

To the second question, What changes could be made in cars or locomotives which would diminish the number of such accidents (employés falling from trains) the following answers were given:

"All valve oiling devices being so arranged that oiling can be done from cab."

"Uniform in height."

"I would have side-ladders, hand-holds and steps on all cars with additional ladder and steps on end of cars to hold on to while pulling pin. Railing around roofs of cars. Air brakes."

"Ladders on ends only."

"A standard self coupler."

"Make all the attachments on which the train men depend to get upon and go over cars as safe and secure as possible."

"Standard mode of construction as regards steps, handles, brake shafts and gear, distance between car bodies, etc."

"Couple cars closer together and reduce slack in drawheads. Have good foot-boards and ladders, and have ladders always in same place."

"Have steps low and in same place, also bent to prevent slipping."

"The application of train-brakes, Westinghouse automatic preferred."

"Compulsory adoption of a standard automatic train brake and coupler."

"More careful design of running boards and the adoption of a standard."

"Adoption of end platforms on all classes of cars without roofs."

"Providing better and more substantial hand-holds and foot-steps and making the position of same a standard."

"Use wider running boards on cars with a gained side to prevent men from slipping in icy weather."

Messrs. Rhodes and Forsyth recommend: "Uniformity in the appliances through which men get off and on cars would aid more than anything else in diminishing the number of accidents from this cause. Also uniformity in the height of cars."

In their circular the committee requested all railroad officers and employés who see it to answer it. But one employé responded, Mr. N. C. Nilsson, of Minneapolis, and his letter was the fullest and the ablest contribution on the subject which was received. In his reply he said:

"I am employed in train service as brakeman, and have had over six years experience as such. Being a subscriber to the *Northwestern Railroader*, and noticing the circulars of inquiry, I will tell just what I think. In reply to questions 1 and 2 I will say that the roofs of a great many cars are built with too much slope, and running boards being very narrow (sometimes not over a foot wide), a person stepping off of the running board will naturally slide clear off the car before he can stop himself. All running-boards should be at least three feet wide, and project over the end of the car about six or eight inches.

"In getting on and off cars in trains the ladder rounds are not always where they should be; for instance, on a car with the ladder on the end there should be a ladder round on the outside, about four feet from the bottom of the body of the car, placed horizontally instead of perpendicular, as it

is most always found. On cars with the ladder on the outside, there should always be a couple of ladder rounds placed on the end of the car: one to step on to, and another for the hands to enable a person to climb around with perfect safety.

"Locomotives always ought to have a small step on each side of the pilot to stand on when coupling shackle-bar of locomotive to a car or another engine. This would reduce a great deal the danger to life and limb."

In reply to the first and second questions of the circular, the Board of Railroad Commissioners of the state of New York, said:

"The Board has recommended to the Legislature the passage of an act containing the following words: 'After Nov. 1, 1888, every freight box car built, purchased or repaired for operation within this state shall be provided with an iron railing on the sides of the roof not less than 8 in. high.' The Board deems that such a railing would be of great benefit as a measure of safety."

The Board of Railroad Commissioners of the State of Massachusets replied:

"A large proportion of the accidents to employés by falling from cars are due to the necessity of traveling over the tops of freight cars in order to set or release the brakes, and could be avoided by the use of a train brake. The number of accidents to brakemen during the past year by falling from freight cars in Massachusetts was as follows: Killed, 24; injured, 50. The adoption of a train brake will, moreover, facilitate the abolition of grade crossings, because it will not be necessary to have the highway bridges so high above the track."

The Massachusetts Commissioners also refer to a special report of their Board in relation to the protection of brake men on freight trains which was published in their eighteenth annual report, dated January, 1887, page 32. In 1886 the Legislature of Massachusetts instructed the Commissioners "to investigate whether there is need of legislation to provide further securities for brakemen while operating freight trains, and especially whether box freight cars ought to be furnished with guard rails on the sides thereof, and report the result of their investigation to the next General Court."

The Commission reported as follows:

"A public hearing was advertised for June 14.

"No one appeared to advocate any legislation. A few railroad officials opposed action upon the grounds that it was needless, expensive and injurious to the cars, rendering them liable to leakage. It was also urged that, as other States were not affected by our laws, such an act would only afford partial protection, and might even be a source of danger to those who should rely upon such a safeguard in cases where none was provided.

"The Commissioners, while inspecting the roads of the state, have made full inquiries of all classes of officials and employés as to the need and probable value of the proposed guards. We have not found any general desire to have them adopted. Very little information has been obtained as to accidents which would have been prevented by the use of a rail. Indeed accidents by falling from the sides of cars are very rare. The more frequent and more dangerous casualties of falling from the ends of cars would not be obviated or reduced by this device. A rail across the ends of box cars would be a grave source of danger, and would not be advocated by any one conversant with the subject.

"Considering the absence of any demand for legislation on the part of those who are supposed to be benefited by it, and regarding the slight advantage to be derived from the proposal as compared with other possible improvements, the Board are not prepared to recommend any action by the Legislature."

The causes of this kind of accidents (falling from cars), as indicated by the answers to the Committee's circular, may be summed up as follows: 1. Train slack. 2. Cars too far apart. 3. Diversity of construction of cars. 4. Inadequate inspection. 5. Defective and wrongly located ladders, steps and hand-holds. 6. Foot boards too narrow or defective. 7. Defective brake apparatus. 8. Inadequate means of getting over coal cars, or from one car to another. 9. Too much slope to car roofs.

The remedies proposed are: 1. Close couplings. 2. Automatic brakes. 3. Less distance between cars. 4. Wider running boards. 5. Better and more substantial ladders, handholds and steps, securely fastened and constructed to a uniform standard. 6. Uniformity in the height of cars. 7. Railing on edge of roofs of cars. 8. Steps on pilots of engines. 9. Improved brake appliances. 10. More thorough inspection of the brakes and appliances for getting on or off cars.

As the efforts of this Association to secure the adoption and use of close couplings and automatic brakes are exerted through other instrumentalities, your Committee do not feel called upon to say more than that they feel satisfied that their use would lessen materially the number of accidents to trainmen, not only from falling from cars and engines, but from other causes.

With reference to the distance between cars, they recommend that the running boards of box-cars be made to project over the ends of cars, so that the minimum distance between the ends of the running boards will not be over 12 in. and that the running boards be made not less than 2 ft. wide, and made of three boards 7 × 1 in. The projecting ends of running boards to be supported on two brackets at each end of car made of ⅝ × 1¾ in. iron, with a hard wood cleat 3 in. × 1 in. on upper ends fastened with ½ inch bolt and nut in each bracket. The lower end of each bracket to be fastened to end of car with two ½ in. bolts and nuts.

With reference to ladders the Committee see no good reason for changing from the present standard of the Association excepting to make the specifications for the construction thereof more explicit, as follows:

That each box and stock car have two ladders, one attached to each end of the car next to the corner which is on the left hand side when a person is facing the end of the car. That the sides of the ladder be made of two pieces of hard wood 3½ in. wide and 2 in. thick, each piece to be fastened with four ½ in. bolts and nuts to the end of car, the narrow sides being against the car. The distance between the strips to be 15 in. Each ladder to have not less than five steps or rounds made of ⅝ in. round iron, each step to be fastened to the ladder sides with one ½ in. bolt in each end. The lower round to have a guard or projection to prevent men from slipping when swinging around the end of the car to get on the step.

A hand-hold to be attached to the top of the car roof parallel with the ladder rounds, 15 in. from the end of the roof. The hand-hold to be made of ⅝ in. round iron, not less than 17 in. long from centre to centre of bolt holes, and to be fastened to the car with two ½ in. lag screws.

Two good substantial steps, made of wrought iron ½ × 1¾ in. section, to be fastened, one to each side sill, at the corner of the car to which the ladder is attached. The step to be not less than 12 in. long, measured horizontally between the sides, and the tread to be not less than 8 in. below the bottom of the sill. The side of the step nearest to the corner of the car to be as near to the corner as practicable. Each side of the step to be fastened to the sill with two ½ in. bolts and nuts.

A hand-hold to be attached to the side of the car above each step—to be placed horizontally, 2 ft. above the bottom of the sills. The hand-hold to be made of ⅝ in. round iron, 2 ft. long in the clear between the ends, to have 2½ in. clear space between it and the sides of the car. To be fastened with one ½ in. lag screw in each end, screwed not less than 2 in. into the frames. Another handle of the same size to be fastened horizontally to the end of the car, the same distance above the sills, and on the opposite side from the ladder

The brake shaft to be placed on what is the left hand corner of the car, when a person is standing on the track facing the end of the car. The ratchet wheel and brake-pawl to be fastened to a suitable casting attached to the roof. A railing or guard to be attached to the end and the roof of the car around the brake shaft. The centre of the brake shaft to be 20 in. from the middle of the car.

Much complaint has been made of the present insecure and unmechanical method of fastening brake wheels to their shafts, and some better way of doing it is needed. The Committee are not prepared to recommend any other method, excepting that in common use, that is by a square end on the shaft and a hole of the same form in the wheel with a nut to hold it on. They do recommend though that nuts be secured by a split spring cotter above them.

With reference to the height of the roofs of cars, the Committee doubt whether at the present time it would be advisable to make any recommendations. The suggestion of the Railroad Commissioners of the state of New York that a railing be placed along the edges of the roofs of cars should also be considered and discussed by the Association. The Committee hesitate about recommending the use of such railings, because it is said by the Massachusetts Commissioners that accidents by falling from the sides of cars are very rare, and because it is undoubtedly true that many accidents are due to very obvious defects which should be remedied at once. The Committee are not prepared to agree with what appears to be the inference of the Massachusetts Commission, that because no one appeared before them to advocate any legislation on the subject, that, therefore, there is no demand for such protection, for the reason that those who need it most have not the time, ability, or intrepidity to appear before a commission of this kind to advocate their own cause.

The Committee suggest that the matter of steps on the pilots of engines be referred to the Master Mechanics' Association for the consideration and action of that body, with the recommendation that that association take some action to establish a standard for pilot steps which will diminish the danger complained of.

There can be little doubt but that in the inspection of the attachments to cars for the safety of trainmen there is often great indifference on the part of inspectors, and those who employ them, concerning the condition of the appliances on which the lives and the limbs of trainmen are dependent. This is properly a matter for discussion and of action, when the rules of interchange are revised. Your Committee recommend that at that time the Association consider the question of enforcing a more rigid inspection of the attachments for the safety of trainmen to insure that they are maintained in good condition.

In reply to the second question of the Committee, "What kind of couplers and dead-blocks are the most dangerous to men in coupling cars?" the following replies have been received:

"Those couplers which do not readily couple together, and those dead-blocks which project too little from the face of the car."

Five members answer:

One says "Link and pin with double dead-blocks."

"The patent couplers now in use and the very large blocks in use on the cars of certain roads."

"The extreme length of this dead-wood makes it exceedingly difficult to couple without risking an arm or hand."

"All kinds of couplers other than the close coupler that does away entirely with the slack and links and pins, and hold the cars taut are at all times dangerous. All dead-blocks are man killers, and should not be used."

"Link and pin when used with other couplers or when not of uniform height."

"Those to which the men are not accustomed."

"Any dead-block that will not allow standing room between ends of cars should both draw-heads be driven under car, or that are below 33 in. from rail or under draw-bar line.

"The present patented devices and dead-blocks."

"Coupling patent draw-bars of the common form."

"Those couplers which do not readily couple together, and those dead-blocks which project too little from face of car."

"The solid head link and pin coupler with double dead-blocks."

"The most dangerous kind of dead-blocks in use on cars are those that extend all the way above and below the draw-bar, giving a person no chance whatever to guide the link."

The Massachusetts Commissioners say: "All couplers, except automatic couplers, are so dangerous that it seems unnecessary to particularize which is the most objectionable. Automatic couplers should be adopted, and if adopted, the style of dead-blocks is unimportant."

The fourth question: "What kind of coupler and dead-blocks do you think is the least dangerous to employés?" was answered as follows:

Mr. Nilsson says: "The least dangerous draw-bar in use in my estimation is the one with the ends or sides of the end hollowed out so that there is no chance to catch the fingers, and the dead-block on top of and part of the draw-bar. No double dead-blocks for me until you are not obliged to go in between cars to couple and uncouple them."

Members of the association say:

"A plain coupler with gravity lock. Levers connected to couple and uncouple from platforms or roofs, double dead-blocks of master car-builders' committee recommended standard, when used on cars of like construction."

"The non-automatic pattern, the Safford cast and Pennsylvania Railroad standard solid wrought iron."

"The common draw-bar as is used on most roads, with the Safford head and the old face-block."

"At present the Safford and single dead-block, but if generally adopted the new M. C. B. standard with suitable dead-blocks."

"Of all the automatics I consider the double dead-blocks and Ames coupler the least dangerous."

"Any automatic coupler in good order in conjunction with another of same make."

"A strong vertical hook coupler of the Janney type with stop on head without dead-blocks."

"A close coupler of the Miller or Janney types and spring buffers. Janney type.

"Think the solid cast-iron draw-bars with a 5-in. block above it the best in absence of an automatic coupler."

"The standard draw-bar of the Lake Shore & Michigan Southern Railway I think the best in use and the dead-blocks used on same cars."

"Outside of automatic, single dead-blocks."

"Automatic hook coupler without dead-blocks."

"Janney type with double dead-blocks."

"Janney coupler, single dead-blocks."

"The coupler and dead-block that are considered least dangerous in coupling cars is a small dead block which we have seen used in Grand Rapids cars and which is much similar to the M. C. B. standard. In the west there is a very strong feeling against dead woods of all kinds. We think this is mainly because some dead-blocks have been constructed for hand coupling of altogether too large dimensions."

These replies do not suggest that any action of the Association is needed in relation to the subject to which they relate excepting, perhaps, the recommendation that there should always be not less than 12 in. clear space between cars when the dead blocks come together, which is provided by the standard dead-blocks recommended by the Association. Especial emphasis should be put on the fact that this space should be clear and not obstructed by projecting bolts, ladders, or other obstructions.

To the fifth question: "Has the introduction of automatic couplers thus far lessened the danger of coupling cars?" thirteen persons reply that it has not, four say the danger has been increased and three have not noticed any difference, and two say the danger has been dimmished. One says: "I believe so, but have had no experience."

The Massachusetts Railroad Commissioners report that "over five thousand approved 'safety' couplers have been applied by the railroad companies of that state, and thus far nine accidents have occurred in their use, eight of which happened in coupling an approved coupler to a coupler of the old style, and one of the nine accidents occurred when both couplers were so-called automatic couplers of the same kind."

To the sixth question: "Would the general introduction of automatic couplers, in your opinion, diminish the danger of coupling cars?" twenty of the replies, including those of the Railroad Commissioners of New York and Massachusetts, say that it would, one member of the Association says it would not, and another says the couplers now in use would not.

The Committee submit their report with the suggestion that their recommendations be submitted to letter ballot as substitutes for the standards adopted in 1879 for the protection of trainmen from accidents.

(Signed) JOHN KIRBY,
M. N. FORNEY.

In the discussion which followed—

Mr. FORNEY urged that two bolts or two lag screws should be used on both ends of all handles and grab-irons, on the security of which men's life depended.

Mr. KIRBY thought one good coach screw properly put in was sufficient, and showed blue prints of a grab-iron for two bolts.

Mr. ROBT. MILLER favored steps on side of cars, as being safer in collision, though more dangerous as regards obstructions, but pointed out that a man can only get off from side of car.

Mr. VERBRYCK suggested that ladders be placed both on ends and sides of car.

Mr. KIRBY narrated a case where a man was knocked off by striking a pile of lumber owing to the ladder being on the side.

Mr. WAGNER (Western Equipment Co.) quoted cases where side ladders have proved more dangerous than end ladders. A fall from an end ladder is fatal if the train is moving.

Mr. JOHN MACKENZIE thought when all obstructions on the side of the track, such as switch targets, etc., were removed, side ladders would be far the safest.

Mr. WALL thought the advantages of both end and side ladders would be gained by end platforms.

Mr. F. D. ADAMS had always taken great interest in this question, but position was not so important as good construction and repair of ladders and fastenings. The wider modern cars do not allow sufficient width for side ladders. Most accidents were caused, however, by insecure fastenings. We only use one bolt at each end of the grab irons, etc., and consider it sufficient. We find many poor fastenings on foreign cars. Lag screws should be screwed well into frame and not merely entered into ceiling. Accidents happened from cast-iron step and handles fastened only with wood screws. Many safety appliances secured only with spikes were quite unsafe and should be rejected. It was often difficult to detect bad condition of fastenings, as wood might be decayed around fastenings.

Mr. TOWNSEND bolted steps on with ⅝ in. bolts. Many lag screws were driven in with a sledge and were not screwed in and some contractors' work was unsafe after a month's running.

It was agreed that the recommendations of the committee should be submitted to letter ballot.

It was announced that the reports of the Committee on Freight Train Brakes, Car Roofs and Wheels were postponed.

The report of the Committee on Car Heating was then read.

Mr. LENTZ moved that the communication to Executive Committee not having been received, the consideration of the report of the Steam Heating Committee be postponed, and this motion was carried.

The report of the Committee on Journal Lubrication was then read.

REPORT OF COMMITTEE ON JOURNAL LUBRICATION AND THE BEST PRACTICE FOR ECONOMIZING OIL.

The committee appointed on journal lubrication and the best practice for economizing oil submit the following:

If the replies received from our circular of inquiry can be taken as a fair indication of the practice throughout the country, it is safe to say that pure petroleum, or some product of distillation of petroleum, is the basis for almost all oil used for journal lubrication on our railways, and that such oil is used without any further admixture with other oils on nearly one-half of the rolling stock, while Galena oil is also used on nearly one-half of the rolling stock and that a small minority only of all our car journals are lubricated with compounds of petroleum and other oils or with grease.

It should be borne in mind, however, that the small number of replies received to the circular does not make this generalization a very safe one, but in any event it is safe to say that petroleum is the basis of almost all our car journal lubricating oils and owing to the low price of petroleum and the good lubricating qualities which it possesses when properly clarified, it is hard to see how any more inexpensive lubricant can be made to successfully compete with petroleum in the lubrication of car journals.

In order to get the best results, however, from the use of

petroleum products for journal lubrication it is generally considered necessary to have great care taken to prevent the loss of oil and on account of the imperfection of journal boxes in this regard, we think the use of grease on certain lines has gained support, which such use would not have gained if the journal boxes had been properly constructed to retain the oil

It is well known that experiments on friction under lubrication with conditions similar to that in our car journals show that a much lower co-efficient of friction is had by using oil, than by using grease. In those experiments the lubricant has been invariably present beyond any question of doubt, between the surfaces to be lubricated; whereas by the use of oil in journal boxes this is not always the case, on account of the oil losing out and there being none, or not a sufficient quantity present at the point needed, at all times, for lubrication.

By the use of good waste mixed with grease and thoroughly packed into the boxes, it is possible to keep a lubricant present under conditions where it is not possible to keep oil throughout a journey, and we think this fact has led some companies to favor the use of grease when they might get much better results with a lower coefficient of friction by the use of oil, provided only that the journal-boxes were properly constructed to retain oil.

A considerable number of parties in answer to our circular alluded to the importance of tight journal boxes, not only to prevent the loss of oil, but to exclude dust from the journal boxes, and your committee regard this as an item of very great importance in the matter of economy of oil for journal lubrication.

We think that a good and ample dust-guard space should be allowed in all journal boxes, certainly not smaller than the dust guard space allowed in the Master Car-Builders' standard journal box, and that a good elastic dust-guard constructed so that it will continue to fill the open space in the back of the boxes as well as being tight on the dust-guard seat on the axle, should be used invariably, and that the somewhat increased cost of construction at this point will be amply justified by the reduction in the cost of lubrication.

It is of course important to use such lids on the journal boxes as will prevent the entrance of dust at that point, but even this is of less importance than tight dust guards at the back.

We do not regard the solid wooden dust guards or the solid vulcanized dust guards as at all satisfactory; there are, however, a number of elastic dust guards which have been brought forward in the past few years, some of which are worthy of attention, and would doubtless repay the railroads for using them, especially where they can be made to go into the dust guard seat of the Master Car Builders' standard boxes.

An examination of the roadbed of any piece of railroad over which a large traffic passes, will convince any one that a large portion of the oil used for lubrication is lost upon the track, and we do not think it extravagant to say that the major part of all the oil used in journal boxes is soon lost on the roadbed and wheels.

Car inspectors and oilers are so closely watched to locate responsibility for boxes which run hot, that they are obliged in many cases, for self protection, to pour oil into boxes which will not retain it, all due to bad construction.

It has been popular of late years to allude to the American system of packing journal boxes as very crude and unsatisfactory, and many attempts have been made to introduce mechanical oilers, which would raise the oil from the bottom of journal boxes to the journals as needed; many of these are laudable attempts to improve journal lubrication, but your committee is of the opinion that none of these methods which they have seen are destined to be superior to packing of good long woolen waste or similar packing in a tight journal box. The mechanical oiler requires a tighter box than the packing does, in order to prevent as great a waste of oil, from the nature of the case; the packing acts as an absorbent to keep the oil in the box to a certain extent, while the mechanical oiler operates to throw the oil to all parts of the box, so that it will eventually disappear if there is any opening through which it can escape.

The method of lubrication which has been popular in England and on the continent for a number of years, namely, the use of grease in the upper portion of the box which would melt by the heat occasioned by friction and then would run by gravity to the journal, lubricating its parts, is perhaps a good method of lubrication where petroleum cannot be had cheaply, but such a method of lubrication requires much more frequent attention to bearings than freight cars are apt to receive on account of the passages for lubrication becoming stopped up, either from the wear of the journal and bearing, or from some foreign particles in the lubricant.

After reviewing the whole subject, your Committee is of the opinion that no greater economy can be had in journal lubrication than by the use of petroleum or its products, either with or without admixtures of other oils or lubricants, along with a good elastic or spongy packing of woolen waste or material equally as good and used in a thoroughly tight and well-constructed journal-box, made especially with a view to preventing the loss of lubricant and excluding foreign particles and dust from journal box.

JNO. W. CLOUD,
H. ROBERTS,
J. N. LAUDER, } Committee.

Mr. WALL moved that the report be received and the committee be discharged and a committee appointed to investigate the subject of dust guards. The motion was carried.

The report of the Committee on Interchangeability of Standard Parts of Cars was then read.

REPORT ON UNIFORMITY OF INTERCHANGEABLE PARTS OF CARS.

The following is a synopsis of the reports received from the following 17 different roads in the Master Car Builders' Association, as to "How Uniformity of the Interchangeable Parts of Cars can be brought about."

Atchison, Topeka & Santa Fe, Central of Georgia, Chicago & Eastern Illinois, Cincinnati, Indianapolis, St. Louis & Chicago, Delaware & Hudson, Grand Trunk, Illinois Central, Lehigh Valley, Lake Shore & Michigan Southern, New York Central & Hudson River, Newport News & Mississippi Valley, New York & New England, Northern Pacific, Peoria, Decatur & Evansville, South Florida, Texas & Pacific, Wilmington & Weldon.

Question No. 1. How can railroad companies secure uniformity to the Master Car-Builders' standard in the shape of tread and flange and the diameters of wheels which they make or buy? Eleven of the roads answer this question as follows: By adopting the Master Car-Builders' standard and insisting that wheel makers conform to it in all respects. The other five roads have a diversity of opinion to such an extent that it is unnecessary to mention.

Q. No. 2. How can master car-builders secure uniformity in the distance between the backs of flanges of their own wheels and those which pass over their lines? Nine of the roads answer as follows: By rigid inspection; all roads to live up the Master Car-Builders' rules.

Q. No. 3. Are the gauges recommended by the Master Car-Builders' Association for the maintenance of uniformity in wheels and axles the best that can be devised? If not, what kind of gauges would you recommend? Twelve roads answer as follows: If properly made and carefully maintained, no improvement to suggest over and above the Master Car-Builders' rules now covering that point.

Q. No. 4. How can journal bearings, journal boxes and pedestals be made interchangeable and kept so? Nine of the roads answer as follows: By adhering strictly to the Master Car-Builders' standard. Seven of the roads suggest, that in order to have uniformity of all patterns, they should all be obtained from one particular shop, where the patterns be made under instructions from the Executive Committee of the Master Car-Builders' Association, and that the railroads in the Association be compelled, or insisted upon, to procure the patterns from this particular shop, so as to have uniformity on all roads that are representatives in the Master Car-Builders' Association. This will also answer question No. 5, which is: "How can brake shoes be made interchangeable and kept so?"

Q. No. 6. How can the screws of bolts and nuts be made interchangeable and kept so? Ten of the roads answer as follows: By adhering strictly to the standard adopted by the Master Car-Builders' Association, which is the United States standard thread.

Q. No. 7. In your opinion is it desirable for the Master Car-Builders' Association to adopt uniform non-automatic draw-gear, and if so, should the present standard height of draw-bar and dimensions of dead-blocks be adhered to? Two of the roads answer this question by saying that a non-automatic draw-gear should be adopted; while eleven of the roads answer that they do not consider it desirable to adopt a non-automatic draw-gear.

Q. No. 8. In the adoption of the Master Car-Builders' standard type of automatic coupler, what steps should be taken to secure uniformity and interchangeability in draw-gear of that kind? On this particular question there is a great diversity of opinion; and from the reports that your Committee have received from the number of roads mentioned, it is impossible to answer the question with any degree of accuracy in conveying the opinion of all the roads mentioned. Some of the roads think that by appointing a committee that will take the matter in hand at once, and the question submitted by letter ballot, as to the best design that can be gotten up for the standard parts of the draft-rigging, would be the best means of securing uniformity. There is but one road out of the 17 that is not in favor of the type of coupler adopted by the Master Car-Builders' Association. This is a question of such great importance, and as it is a part of the car that requires to be renewed frequently, on account of being easily damaged, your committee is unable to decide which is the best way to bring about uniformity in this particular part of cars.

Q. No. 9. Besides those already adopted by the Master Car-Builders' Association, what other parts of cars should be standardized by the Association? Fourteen of the roads have answered this question, and their answers vary, from one part to the entire car. The prevailing sentiments of the answers to the questions are the draft timbers, draw-bar gearings, brake connections, ladders, handholders, roof and dimensions of timbers should be standardized, in addition to the standards already adopted by the Master Car-builders' Association.

Your committee would say in conclusion that we do not think seventeen roads is a fair representation of the number of roads making up the membership of the Master Car-Builders' Association; and that if the questions asked were submitted for adoption by letter ballot, it would show that it would be impossible to adopt any of the parts mentioned in the answers to the different questions. Below is quoted a letter received from General Master Car-Builder John Kirby, of the Lake Shore & Michigan Southern, which comes as near answering the questions asked as any letter received:

"*John Hodge, Esq., A., T. & S. F. Ry., Topeka, Kan.:*

"DEAR SIR: Replying to your letter of the 24th ult., also to the circular of inquiry, I affirm that uniformity, strictly speaking, cannot be maintained under more than one head, and for a committee to give their time to that subject, all they can say is that to obtain uniformity under existing circumstances is an impossibility. (Signed) Yours truly, JOHN KIRBY, G. M. C. B."

H. MIDDLETON,
JOHN HODGE,
SAM'L IRVIN, } Committee.

The report was received and the committee discharged.

Mr. FORSYTH asked if the Executive Committee were prepared to report on the proposed standard axle for 60,000-lb. cars?

Mr. FORNEY replied that he had received replies from numerous railroads as to the dimensions of the proposed standard axle. An axle submitted to letter ballot last year was lost; but if another is now proposed at this convention the matter would be voted on within sixty days.

Mr. T. A. BISSELL suggested that the former committee report again.

Mr. WALL supported this motion, but as only one member of the committee was present, it was agreed to appoint new members in place of those absent. The committee as reconstructed consists of Mr. Blackall, Mr. McWood, Mr. Forsyth, Mr. Robert Miller, Mr. Lentz and Mr. Robert McKenna.

The committee will report to this Convention before it adjourns.

The meeting then adjourned to the following day, Wednesday.

WEDNESDAY, JUNE 13.

Mr. WALL hoped that the proposed new rule, referring to other defects for which owners should be responsible, would be referred to committee. The motion was carried.

Mr. WALL moved as a new rule that cars sent home as unfit for further service shall bear a home card attached to each side of car, and explaining why it was sent home, and giving other necessary particulars signed by the head of the department. There was much need of some means of getting old dilapidated cars sent home for necessary repairs.

Mr. ROBERT MILLER narrated a case in which Mr. Wall's proposed rule would be of considerable service. Mr. Schryer thought a new card was not wanted. Mr. Thos. Sutherland thought that old cars should be billed rather than carded home, as they can then be traced. Mr. G. Chamberlin and Mr. Miller thought that billed empty cars are invariably loaded en route. Mr. Barr and Mr. Sutherland thought that directions as to destination of car would not be observed. Mr. Wall's motion was carried.

Mr. VERBRYCK proposed to add words "worn out" to Rule No. —. Mr. Barr proposed to change "unworn flat" to "worn through chill." Mr. Marden suggested the Pennsylvania term, "unworn hollow." Several members stated that skid wheels were charged as "worn flat." Mr. Davenport said that any wheel worn flat by sliding would show fine checks or cracks if rubbed with emery cloth. Mr. Barr's motion carried.

Mr. SCHROYER found great difficulty in boring wheels to fit old axles, as provided in Rule 16. A reduction of one sixty fourth on the axle caused rejection, though some small reduction was generally necessary, as one could seldom find a tool to fit exactly. Mr. Wall pointed out that even a small reduction of size affected the strength of the axle.

Mr. SCHROYER asked if southern or yellow pine was equally as good as oak for sills, and Mr. Adams thought yes. Mr. Barr preferred oak centre sills and Mr. Verbryck and W. B. Snow found no general objection to pine sills.

Mr. FRANK SHEPPARD asked that in Rule 22, a price might be placed on cars constructed partly of iron (chiefly coal cars). Mr. Wall moved to add "wood or iron," to the word "bodies," Rule 22. Iron cars belong to the Iron Car Co., of New York. They cost two or three times as much as ordinary coal cars, and railroads cannot afford to insure them. Mr. John Mackenzie stated that some special stock cars had paper wheels. Mr. Barr thought refrigerator cars should no longer be classed as special cars. Mr. Wall's motion was carried.

Mr. BARR stated that the price of refrigerator cars varied from $900 to $1,100, including trucks, and Mr. Schroyer thought $800 too low for body of some refrigerator cars. Mr. W. B. Snow had built refrigerator cars costing without royalty as high as $750, including trucks.

Mr. WALL moved that the word "applied" be added after the word "door" in Rule 25. Carried.

Mr. WALL moved to add words "one journal box complete, $2 for cars of 60,000 lbs. capacity, and $1.75 for 40,000 lb. cars, crediting ¾ cent per pound." Mr. Marden wished to know whether the kind of cover affected the question of a box being M. C. B. standard. Mr. Adams thought it unfair to reject a box which was correct to standard, but had different kind of cover. Motion lost.

Mr. JOHN MACKENZIE moved that Rule 25 be amended by the addition of a clause regarding change of journal boxes on foreign cars. Motion lost.

Mr. MCELWAIN moved the appointment of an Arbitration Committee of five to fulfill the functions provided for in Rule 29. Motion carried unanimously.

Mr. WALL asked what is the responsibility of a road delivering cars to roads not belonging to the Association, and moved the insertion of a rule following 26, providing that when a car is delivered to a road not belonging to the Association, the delivering road shall be responsible to the owners of the car for the return of the car in the same condition as when it was first delivered. Mr. Verbryck and Mr. Barr thought such a rule would not work well and that such cars should be settled for legally. Mr. Wall maintained that it was needed, was in accordance with spirit of M. C. B. rules, and would induce other roads to join the Association. Motion lost.

Mr. MCELWAIN moved that the rules, as revised, come into force on September 1st, 1888, as it was impossible to obtain copies and distribute them before that date. Motion carried.

The Convention then adjourned until Thursday morning.

REPORT OF THE COMMITTEE ON FREIGHT TRAIN BRAKES.

In our report to the convention last year the main conclusion we arrived at was that the best type of brake for freight service was one operated by air, and in which the valves were actuated by electricity. Since that time your Committee has not made any further trial of brakes, but the aspect of the question has been much changed by the remarkable results achieved in non-official trials which have taken place in various parts of the country, and have been witnessed by many of the members of this Association. These trials show that there is now a brake in the market which can be relied on as efficient in any condition of freight service.

The present position of the freight train brake is briefly as follows:

First—Brakes can be, practically speaking, simultaneously applied without electricity throughout a train of 50 freight cars.

Second—Other inventors are working at the problem of making an air brake which will be rapid in action and suitable for service on freight trains. We also understand that inventors are working at buffer and electric friction brakes, but we have no reason to hope that brakes on these principles can successfully compete with air brakes.

In view of these conditions your Committee does not recommend the adoption of any particular brake, but considers that a freight train brake should fulfill the following conditions:

First, it shall work with air of 70 lbs. pressure. A reduction of 8 lbs. shall set the brakes lightly, and a restoration of pressure shall release the brakes.

Second, it shall work without shock on a train of 50 cars.

Third, it shall stop a train of 50 empty freight cars when running at 20 miles per hour, within 200 feet, on a level.

Fourth, when tried on a train of 50 cars, it shall maintain an even speed of 15 miles an hour down a grade of 53 ft. per mile without variation of more than 5 miles per hour above or below that speed at any time during the descent.

Fifth, the brake shall be capable of being applied, released and graduated on the whole train by the engine, or without any assistance from the brakemen or conductor.

Sixth, the hose coupling shall couple with the present Westinghouse coupling.

We recommend that all freight cars fitted with such a brake shall be marked "Air brakes" on each side of the car, near the top. The Committee further recommends the use of

iron or steel brake beams, and that the subject of the best form and proportion of brake gear and the selection of a standard solid brake shoe for use with metallic brake beams should be entrusted to a committee appointed for the purpose. (Signed), G. W. RHODES.
GEORGE HACKNEY.
JOHN S. LENTZ.
D. H. NEALE.

It was resolved that the report be received, the Committee thanked for their services, and their recommendation as to the appointment of a committee on brake gear be adopted.

EXHIBITS.

The exhibit of railroad appliances was very complete, as the following by no means exhaustive list will show:

The Hutchins car roof was shown by a model.

The perfection weather strip for passenger car doors was shown by the Richmond Weather Strip Co., of Richmond, Ind.

A new form of electric friction freight brake, which has the merit of being cheap and occupying little space, is shown by the Widdifield & Button Brake Co.

A full sized Sewall steam heating coupler was exhibited mounted as in position on a car.

The Foster Lighting Co. also made an exhibit of their apparatus for lighting cars.

The Standard Car Heating & Ventilating Co. of Pittsburgh showed drawings and blue prints of their method of heating cars.

Fairbanks & Co. show specimens of washers, valves, etc., made of vulcabeston, and suitable for use in car heating, for dust-guards, electrical purposes, etc. Asbestos packed globe valves, etc., are also shown.

A tubular trussed brake beam is exhibited by the National Hollow Brake Beam Co., of Chicago. It is stated to have stood a strain of 19,000 lbs.

The Central steel brake beam is shown by the Michigan Railway Supply Co., of Chicago.

The Gold coupling and trap for steam heating are shown.

The following car couplers of the vertical plane type were exhibited:

The Cowell, the Herrington, the Van Dorn, the Lorraine, the Boston Automatic, the Timms, the Westbrook & Cook and the Hicks, the Dowling and the Van Dorston. The Cowell Co. also show their buffer and supplementary platform. Several other couplers are shown by models, including the Smillie

Car chains are shown by D. P. Hayden Saddlery Hardware Co., of Columbus, O. This company have their own rolling mills and iron works, and make a great variety of chains for various purposes. These chains are tested by a Riehle machine.

Dust guards, etc., and vulcanized fibre track washers, are shown by the Vulcanized Fibre Co., of Wilmington, Del.

The Moffat closet for passengers was exhibited by the Moffat Manufacturing Co., of Chicago.

The Hitchcock reclining chair is shown in a full-sized chair.

The Martin Car-Heating Co. exhibit specimens of their coupling both with rubber hose and metallic connections.

The Susemihl car door is shown by a model. W. D. Bending's car heater is shown.

The Davis Car Spring Co. show plates for spiral springs.

The Handy car-book is shown; also the M'Elroy steam heating coupler, with trap, and the Ross pressure regulating valve, and the Timms journal box are exhibited.

The Damascus Bronze Co. show specimens of their metal as applied to bearings, etc.

The Tilden wrecking frog is shown, and a model is shown of the Riordon refrigerator car.

A car journal box is exhibited by Mr. F. D. Adams with an improved elastic dust guard.

Specimens of the fernoline process for preserving wood, are shown.

A hot pressed steel stake pocket is shown by the Dunham Manufacturing Co., of Boston.

The Dunham Manufacturing Co. exhibit no less than five different articles, including their well-known car door, safety gate and tilting car seat.

The Ross-Meehan brake shoe is shown by the Congdon Brake Shoe Co.

The Roberts wire car-seat bottom is shown by two full-sized seats, one upholstered in plush and one in leather.

The Emmert car seat is shown by the Johnson Car Seat Co., of Chicago.

The Bushnell spring is shown by E. L. Bushnell, of Poughkeepsie, N. Y.

Various uses of asbestos are shown by the H. W. Johns Co., of New York.

The Streator reclining chair is shown by a full sized seat.

Shields & Brown show sectional asbestos covering for pipes.

The Fowler rolled steel wheel is shown.

A very handsome exhibit of pressed wood panels in exact imitation of hand carving is made by the Charles W. Spurr Co. of New York.

The Chapman lubricated jack was shown by the Chapman Jack Co., of Cleveland, Ohio.

The Erie Car Heating Co., of Erie, Pa., exhibit their car-heating apparatus, including coupler.

The French Spring Co., of Pittsburgh, exhibit Geo. W. Morris' patent wrought steel oil-box cover.

The Detroit Nut Lock Co. exhibit their special nut lock, which has been largely used on freight cars on the Michigan Central and other roads.

The Hoke spark-proof car door fastener is shown.

The Granular Metal Co., of Boston, show bearings, etc., made of their metal.

The De-oxidized Metal Co. show some handsome specimens of artistic car furnishings.

The Adams & Westlake Co., of Chicago, show a new form of railroad lantern, termed the Adams, with solid top and bottom and steel guard.

The Bradley upright power hammer was shown by a working model.

The Star de-odorizer, for use in urinals, etc., was exhibited.

A model was exhibited of the Ruffhead freight car door, which, when closed, is flush with the sides of the car.

The Boies steel wheel is represented by a full sized wheel, exhibited by the Boies Steel Wheel Co., of Scranton, Pa.

The Paige steel tired car wheel is shown by a model.

The Soule dust guard, which is lined with rawhide, is shown by W. S. Soule & Co., Boston, Mass.

The Godwin handy car lock and seal is shown.

The Government Waterproof Paint Co., of Boston, exhibit several specimens of their paint.

A combined footcock, strainer cleaner and frost cock is shown by Mr. H. D. Medrick, of Port Jervis, N. Y.

One of the exhibits which excited most interest was a solid pressed steel truck, exhibited by Mr. Samson Fox of the Leeds Forge Co., of New York. The truck exhibited was made for the narrow gauge lines of India, and differs considerably in form from those used here. The principle on which the truck is made is applicable to any form of truck for either passenger or freight service. The workmanship was very good and the truck appears to be very strong and light, and not liable to get out of square. It is claimed that it is cheaper than a truck made in the usual manner.

The American Waltham Watch Co., of Boston, Mass., show a handsome case of their non-magnetic watches.

The Automatic Car Heating Coupler Co., of Detroit, exhibit a model of their car heating coupler.

The American Continuous Draw-bar Company, of Aurora, Ill., display an interesting model of their device.

Love Bros., Poughkeepsie, N. Y., exhibit a model of their car-door hanger.

The Northwestern Modern Car Heating & Lighting Co., St. Paul, show trap and coupler for continuous steam heating.

The National Lock Washer Co., of Newark, N. J., is represented by various sizes of their washers for general construction and track service.

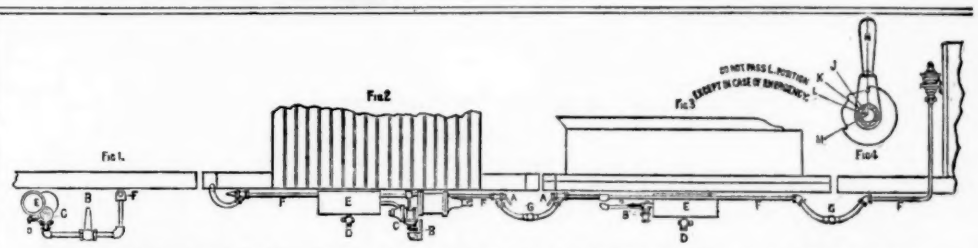
The Chase Combination Car Spring Manufacturing Co., of New York, show one of their full size car springs. Represented by Mr. Joel Farist, the President.

The Magnolia Anti-friction Metal Co. of New York show samples of their magnolia metal and camelia journal bearings.

The Williames system of railroad car heating, Boston, shows a coupler for continuous car heating.

The Hale & Kilbourne Manufacturing Co., Philadelphia, show several samples of car seats, one a new style of reclining car seat.

The Turner-Beard Brake Co., of Boston, exhibit a model of their buffer brake.



EXPLANATION.—Fig. 1, End View of Car. 2, Side View of Car. 3, Side View of Tender. 4, Engineer's New Valve. H, Position of Handle for releasing Brake. J, Running Position. K, on Lap. L, Application of Brake, Service Stop. M, Application of Brake, Emergency Stop. A, Stop Cocks in main Brake Pipes. B, Plug Cock. C, Triple Valve. D, Release Cock in Auxiliary Reservoir. E, Auxiliary Reservoir. F, Main Brake Pipe. G, Hose and Couplings. B', Position of Handle for Automatic Brake on Tender. B'', Position of Handle when Brake cut out on Tender.

Diagram to Accompany Working Instructions for the Westinghouse Brake.

Working Instructions, Quick Acting Westinghouse Brake.

The following instructions for working the Westinghouse improved quick acting automatic brake are given in the Boston & Albany time-table. As this brake with the improved engineer's valve is being rapidly introduced, these instructions may be of interest to many of our readers:

ENGINEMEN.

1. Fill the oil cup on the pipe leading to the steam cylinder, with cylinder oil; open the cock in the bottom half a turn; this will lubricate the steam cylinder. Kerosene oil must not be used for oiling cylinders.

2. Start the pump gradually, to allow the condensed steam to escape; after the pump has made a few strokes, put a small quantity of cylinder oil into the cup on the air cylinder; this will lubricate the air cylinder.

3. Always have a pressure of not less than 65 lbs. on the gauge connecting with the train line. The gauge has two pointers; one shows the pressure in train pipe, the other shows the pressure in main reservoir. This is to show the engineer the reserve pressure there is in the main reservoir, to assist in releasing brake at all times.

4. When the cars of a train are on two or more tracks, the reservoirs of all the cars should be filled with the same pressure. This is to prevent the brakes on forward cars of a train from setting when all the cars are put together. This occurs when an engine is connected with baggage and express cars for a long time.

5. For the application and working of engineer's valve, see engraving.

6. When taking on extra cars, apply the brake on cars already connected with engine, before the cocks on extra cars can be opened (which will reduce the pressure on gauge connected with train pipe), after cocks are opened turn the handle of brake valve to the left; this will let off brakes on the forward cars and also fill the reservoirs on extra. After this is done, and the air has been equalized in the whole train, apply and release brakes on all cars.

7. If while the train is in motion the brakes set from some unknown cause, move the handle of brake valve to the position for releasing brake; if this does not release brake, put the handle on lap and hold it until the pressure in main reservoir has been increased 10 lbs., then throw the brake to release position. If this does not accomplish the desired end, then apply and release brake.

8. Never use the brake in switching trains, or when the brakemen are expected to brake.

9. Keep the main reservoir free from water; also, the triple valve under the tender should be drained daily, to let out any water that may have collected.

10. Always have on hand an extra hose and coupling.

11. For the automatic brake, the handle of the four-way cock must be turned horizontally; if turned midway between this position and a vertical one, it will close communication with the brake cylinder and reservoir, but should be so turned when desirable to have the brakes cut out on tender.

12. The improved brake is automatic only, there being no straight air. If from any cause it becomes necessary to cut out the brake on any car, it is done by closing the plug-cock on cross-over pipe between reservoir and cylinder. When this cock is open, the handle points upwards; when closed, it stands horizontal.

13. When there are two engines on a train, the engineer on forward engine will do the braking. The engineer on rear engine will put the handle of brake valve on "lap position," and close the small plug cock on back side of brake valve; this will make the engine same as a car. Run pump on rear engine slowly, to keep exhaust pipe free.

14. If the brake valve becomes deranged from any cause, it can be used as a plug cock, by closing small plug cock on back side, and moving the handle to "emergency position." When this is necessary, apply brake carefully to avoid jerking the train.

TRAINMEN.

1. In making up trains, all the couplings must be united, so that the brakes will apply throughout the entire train. The cocks in the brake pipe must all be opened, except that on the rear of the last car, which must be closed, and the coupling hung up in the bracket.

2. In detatching engines or cars, the couplings must invariably be parted by hand; the cocks in the brake pipes must always be closed before separating the couplings, to prevent application of the brakes.

3. At stations where it may be necessary to cut the train, to take or leave cars, trainmen must not turn the stop cock or disconnect hose until the brakes have been released by the engineer.

4. If the brakes are applied when the engine is not attached to the train or car, they can be released by opening the release cock in the auxiliary reservoir.

5. The valve for the application of the brakes from the inside of the car should be tight, and must always be examined when the car is standing at terminal stations. This valve should only be used in case of emergency.

6. The brakes must be applied while standing at terminal stations, and inspected by the brakemen, to see that all the cars are in working order. Conductors will see that this test is made, and when trains start from points at which no inspectors are located they must make the test in place of inspectors.

7. If the packing in the couplings freeze so as to leak, thaw them out with a torch.

8. Report to inspectors any car not in working order.

9. Keep the hose coupled together or hung up in the bracket provided for that purpose, when not in use.

INSPECTORS.

1. The adjustment of the brakes should be such that, when applied, the pistons in the brake cylinders will not travel to exceed eight or nine in.; this will allow room for wear of shoes, stretching of rods, springing brake beams, etc., while on the road.

2. Great care must be exercised in taking up the slack in connections, to have the levers and pistons pushed back to their proper places, and the slack taken up by the under connections or dead lever.

3. The brake cylinders must be always kept clean and free from gum, so that they will readily release when the air has been discharged; oiled once a month, and note the last date of oiling on the cylinder with chalk.

4. The inspectors will examine each car throughout the entire train, when engineer applies the brakes, to see that the brakes have applied properly, and if all is right, will signal the engineer, who will release them.

5. Inspectors will be held responsible for trains leaving stations with the air brakes not in perfect working order.

6. Inspectors at all points must keep on hand, ready for immediate use, a supply of all parts that are liable to get out of repair, as well as tools necessary for making repairs.

Engineers will report promptly to division master mechanic or foreman of round-house any defect in their brake or neglect of inspectors to comply with the above rules.

Machine Designing.

The following is an abstract of a paper read before the Franklin Institute by Mr. John E. Sweet, the designer of the well-known straight line engine:

The lecturer stated that he would endeavor to formulate some rules and establish some principles by which bad work in machine designing might be avoided.

Machines should be designed and constructed to remain true, regardless of wear and all external influences, but many machine tools used by machine builders stand upon second or third floors, and none, except those mounted upon a single pedestal, are free from detrimental torsion where the floor upon which they rest is distorted by unequal loading. The mason, in many cases, supplies the frame rather than a support. Is this necessary even in a planing machine of 40 ft. length of bed and a 30-ft. table? The bed could be cast in three pieces—the centre a rectangular box 5 or 6 ft. square, 20 ft. long, with internal end flanges, ways planed on its upper surface, and ends squared off and bolted to the ends of two bevel pieces of half the length. The whole would rest on two cross walls, and would, if once made true, remain so, regardless of external influences. Many lathes rest on six and eight feet., engines on ten, and a planing machine on a dozen. But they do not always remain true, and the principle should be avoided where possible, and when it cannot be avoided, the true principle of foundation building should be employed.

John Richards, the well-known designer of wood-working machinery, pointed out the true form for constructing machine framing. The usual form of lathe and planer beds or frames is two side plates and several cross girts; their duty is to guide the carriages or tables in straight lines, and resist bending and torsional strains. In order to make a strong lathe frame more iron is too often used rather than a better disposition of the metal. The fallacy of making things stronger by simply adding iron is illustrated by the three models as shown in fig. 1. All are of the same general dimensions and contain the same amount of material. The one made on the box principle *c* proved to be 50 per cent. stiffer in a vertical direction than either *a* or *b*, from twenty to fifty times stiffer sidewise, and thirteen times more rigid against torsion than either of the others.

However strong a frame may be, its own weight and the weight of the work upon it tends to spring it unless evenly distributed, and to twist it unless evenly proportioned. For all small machines the single post obviates all trouble, but for machine tools of from twice to a half dozen times their own length the single post is not available. Four legs are used for machines up to ten feet or so, and above that various legs and then solid masonry. A good job would be secured if the four legs were always set upon solid masonry, and leveled perfectly if the legs were set nearly one-fourth the way from the end of the bed. The bed of an iron planing machine, 12 ft. in length, will be equally well supported by four legs if each pair is set 3 ft. from the ends—that is, 6 ft. apart—as by six legs, two pair at the ends and one in the centre, and the pairs 6 ft. apart. There are 6 ft. of unsupported bed in either case, but with four legs, settling of the foundation will not bend the bed.

Any iron planing machine, if put in good condition and set upon the ordinary wood floors, may be made to plane work winding in either direction by shifting a moving load of a few hundred pounds on the floor from one corner of the machine to the other, and the ways of the ordinary turning lathe may be still more easily distorted. The remedy is to rest the structure on the two housings at one end and on a

Proposed Form for Car-Service Statistics.

MONTH.	SANTA FÉ CARS ON FOREIGN RAILROADS.							FOREIGN CARS ON SANTA FE R. R.							BALANCE.							
	Number of days.....	Number of miles.....	Cost at ¾ cent per mile..	Cost at ¼ cent per mile and 15 cents per day.....	New system		Earnings per car per day.		Number of days.....	Number of miles.....	Cost at ¾ cent per mile..	Cost at ¼ cent per mile and 15 cents per day.....	New system		Earnings per car per day.		Under old system.		Under new system.		Net balance under new system.		Net balance at 25 cents per day.	
					Increase.....	Decrease.....	Old system...	New system...					Increase.....	Decrease.....	Old System...	New system...	Against Santa Fe.....	In favor Santa Fe.....	Against Santa Fe.....	In favor Santa Fe.....	Against Santa Fe.....	In favor Santa Fe.....	Against Santa Fe.....	In favor Santa Fe.....
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pair of legs about one-fourth of the way back from the other, pivoted to the bed on a single bolt as near the top as possible.

Many wood-working machines cannot be built on the single rectangular box plan—rested on three points of support. Fortunately, the requirements are not such as demand absolute straight and flat work, partly because the material will not remain straight and flat even if once made so; and in the design of wood-working machinery it is of more importance to so design that one section or element shall remain true within itself, than that the various elements should remain true with one another.

The propelling powers of a lathe slide should be as near the point of greatest resistance as possible, as in a Sellers lathe, and the guiding ways should be as close to the greatest resistance and propelling power as possible, and all other necessary guiding surfaces made to run as free as possible.

The guiding side of the carriage should be long and as rigid as possible—nothing short of casting the apron in the same piece will be strong enough, because with a long, elastic guide, heavy work will spring it down and wear it away at the centre, and with light work it will ride at the ends with a chattering cut. In the lathe the cutting point of the tool is not in line with the lead screw or rack, and a twisting strain has to be resisted with the slides, whereas, in an upright drill the sliding sleeve is directly over and in line with the drill, and subject to no side strain.

The ease with which a cast-iron bar can be sprung is often overlooked. Cast-iron, when subject to a bending strain, acts like a stiff spring, but when subject to compression it dents like a plastic substance. If a thick coating of mud be leveled off true, and a board be laid upon it, it will fit, but if two heavy weights be placed on the ends, the centre will be thrown up in the air far away from the mud; and the same thing occurs if a perfectly straight bar of cast-iron be placed on a perfectly straight planer-bed—the two will fit, but when the ends of the bar are bolted down, the centre of the bar will be up to a surprising degree. Sliding surfaces working on oil will, when unequally loaded, settle through the oil where the load exists and spring away where it is not.

The weak point in small machines is their weakness to desist torsional strain in the bed, and both torsional and bending strain in the table. The ways of a planer are soon cut, but this is not caused by overloading or insufficient surface. It is caused by springing. Twist the bed upon the floor and the table will rest the hardest on two corners. Strap, or bolt, or wedge a casting upon the table, or tighten up a piece between a pair of centres eight or ten inches above the table, and bend the table to an extent only equal to the thickness of the film of oil between the surface of the ways, and the large wearing surface is reduced to two wearing points. In designing, the piece should be considered as a stiff spring. The tooth of a gear wheel is a cast-iron spring, and if only treated as a spring fewer would be broken.

In a certain case the breakages of teeth in pinions occurred about as the square root of their number, but when the form was changed by cutting out at the root in this form (fig. 2) the breakage ceased.

a, fig. 2, shows an ordinary gear tooth and *b*, the form as changed; *c* and *d* show the two forms of the same width, but increased to six times the length. If the two are considered as springs, it will be seen that *d* is much less likely to be broken by a blow or strain.

The remedy for the flimsy bed is the box section; the remedy for the flimsy planer table is the deep box section, and with this advantage, that the upper edge can be made to shelve over above the reversing dogs to the full width between the housings.

The parabolic form of housing is elegant in appearance, but theoretically right only when of uniform cross section. If the housing is constructed on the brace plan, the braces should be straight, as in the old Bement, and the centre line of strain pass through the centre line of the brace. If the housing is to take the form of a curve, the section should be practically uniform, and the curve drawn by an artist. Many housings are quite rigid enough in the direction of the travel of the table, but weak against side pressure. The hollow-box section, with secure attachment to the bed and a deep cross-beam at the top, are the remedies.

Raising and lowering cross heads, large and small, by two screws is slow even when done by power. Counter-weights just balancing the cross head, with metal straps rather than chains or ropes, large wheels with small anti-friction journals, and the cross head guarded by one post only, change a slow to a quick arrangement, and a task to a comfort. Housings of the hollow box section furnish an excellent place for the counter-weights.

The moving head, which is not expected to move while under pressure, has settled into one form, and when hooked over a square ledge at the top is pretty satisfactory. But in other machines built in the form of planing machines, in which the head is traversed while cutting, as in the case with the profiling machine, the planer-head form is not right, as both the propelling screw and guide should be as low down as possible.

Since the post-drilling machine first made its appearance, there have been added Blasdell's quick return, the automatic feed, belt-driven spindles, back gears placed where they ought to be, with many minor improvements; but some sort of snap clutch by which the main spindle could be stopped instantly by touching a trigger with the foot would save many drills and accidents. A special device for use on a drilling machine, used by Mr. Lipe, is in the form of a bracket or knee adjustably attached to the post, which has in its upper surface a V into which round pieces of almost any size can be fastened, so that the drill will pass through it diametrically. It is not only useful in making holes through round bars, but straight through bosses and collars as well.

The radial drill points its nose in all directions but skyward, but whether in its best form is not certain, as the handle of the belt shipper does not follow around within reach of the drill.

Modern boring machines, both horizontal and vertical, are tolerably perfect, but a rotary spindle driven at various speeds and fixed in a head movable along the cross beam of the vertical machine might be valuable. This would be complete for boring the crank-pin hole in engine cranks, and a complete plain radial drilling machine, useful in all shops where the machine only has legitimate work enough to keep it employed for a part of the time. Combined tools and machines are, however, seldom successful.

The slotting machine, like others of the overhanging class, such as drilling and punching machines, is subject to strains that they have to resist to a disadvantage, and where springing to a certain extent cannot be avoided. The framing should be devised so as to have the springing do the least possible harm. A slotting machine might be so designed that the spring would have a direct tendency to throw the cut out of square with the table; whereas, if the sliding bar was worked with a walking-beam, there would be no detrimental spring whatever.

Springing adds to the power required to do the punching,

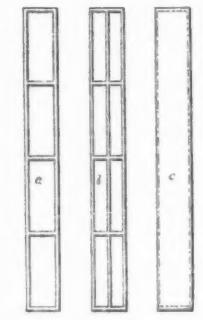


FIG. 1.

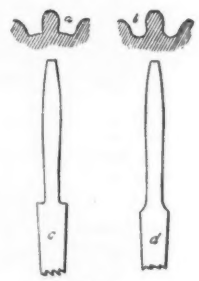


FIG. 2.

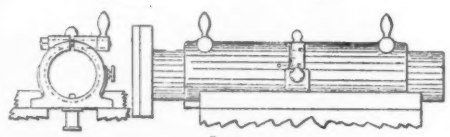


FIG. 3.

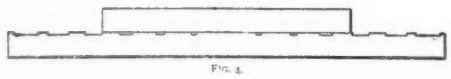


FIG. 4.

a, *b*, *c*, fig. 1, represents the three forms of lathe and planer construction.

a, fig. 2, represents an ordinary pinion tooth and *b* shows one of the same size strengthened by cutting out metal at the root; *c* and *d* show the same width of teeth extended to six times the length, showing their character if considered as springs.

Fig. 3 shows the suggestion on shaper slides, and fig. 4 the method of cutting away the ways of a planer so as to reduce the wearing surface of the bed to the same extent as the table. In small machines the spaces are cut out by milling, and in large surfaces, such as a planing machine bed, the spaces are cast and filled with soft metal.

and unless specially designed to avoid such a result, the springing throws the punch out of adjustment with the die, and bad work and dull tools are the result. If the upper and lower parts of a punching machine are just equally rigid or equally elastic, and the punch and die central between the two, then the springing, however much, would not throw the tools out of register, and would do no harm except the waste of power. The loss of power in springing a machine is sometimes returned when the spring returns, but in a punching machine all power expanded in springing the frame is a dead loss.

Springing of machine framing and tools add to the cost of doing work, not only on account of a loss of power, but in the dulling of the cutters, and in this none more so than the milling machine. The tools or cutters themselves are costly, and the act of cutting, as performed by an ordinary slabbing cutter, differs from nearly all other cutting action. Each separate chip removed is a wedge-shape piece, and the cutting edge of the cutter starts in at the point of the wedge. The appearance of a milled surface, as ordinarily left on soft metal, is unusually more uneven than any feed or imperfection in the cutter accounts for, and it is safe to assume that the teeth of the cutters slip over more or less and then bite and gouge in deeper than if each one took its allotted amount. Both actions tend to dull the cutters, and not only the spring of the machine and cutters tend to produce this result, but an elastic feed motion also contributes to this same result, so that a rigid feed is more essential in a milling machine than in any other. Possibly it would be an improvement to feed the work to the milling machine in the opposite direction, that is, so the cutting edges of the milling cutter would start in at the large end of the wedge. In the roughing cut the cutting edge would be starting in on the scale, and in finishing flat work the cut is so slight that there could be but little gain. Certain classes of work, of whatever size, can best be done by rotary cutters, while other kinds will always be best done by the planing, shaping and slotting machines.

The cutting action adopted to perform a certain operation is important. The most perfect of all machine work is done by an emery wheel and end mill. Cutting tools, traversing in curved paths across a flat surface, have an advantage in never following over twice in exactly the same path, as is the case in a planer tool, which accounts for the absence of chatter; but, on the other hand, the cutting blade traverses over eleven inches of distance to finish a 7-in. cut. The planer wastes time in stopping, running back and starting, while the traversing blades are always at it.

We all look for the best new machine, but which is to be the best old one? All calculations are based on a new gear teeth, and none on that one-half worn cut. The gear tooth needs an undercut at the root as much as the cylinder needs a counter-bore. The epicycloidal may be the best form for a new gear, and the single arc odontograph for an old one.

With the exception of the J. Morton Poole grinding machine, nearly every machine tool depends for the accuracy of its work upon the accuracy of sliding surfaces. In the best work special methods are adopted to make them true, after which they are left to fate to keep them so. Who has ever deliberately undertaken to plan and build a planing machine that should maintain perfect truth during its entire existence? The planing machine has a short table working on a long bed, the milling machine a long table working on a short bed—the lathe a short rest on long slides and the shaper a long slide in a short guide. The tool builder would laugh at the engine builder who should run a cross head on guides not cut away so the cross-head would overrun at the ends; and yet he makes the sliding block on the cross-feed of his lathe 6 in. long working on a dovetail 2 ft. long, sometimes running off at one end and never at the other. The sum of the two fitted surfaces is 30 in. If divided equally, that is, a 15 in. sliding on a 15 in. dovetail, the two would remain true and be a good job as long as the lathe lasted. Equal length sliding surfaces can usually be employed in all the slides on milling machines, punching machines and many others, and should be used wherever possible. A short sliding block on a long guide invariably gets bad sooner or later, and refitting becomes necessary. The sliding-head of a shaper invariably made longer than its guide, is a nuisance that can be abated. The requirements call for a slide to work at all sorts of stroke from an inch to a foot and at positions varying as much as a foot. As now made, much of the back end of the sliding arm does not get $\frac{1}{100}$th part of the wear that the front end does, and often none at all. It may be worked for a year at short stroke and in one place, and when the attempt is made to use it in a different position, it is so loose in one position and so tight in another as to be worse than useless. The remedy is easy. Make the two sliding surfaces of a length and attach the connecting rod to an immovable pin, then both ends of the slide will always overrun, whether the stroke is an inch or a foot. To provide for the varying position of cut, the plan shown in fig. 3 is presented.

This slide is guided in the usual way and driven by a connecting rod rigidly attached to the side or bottom, as most convenient. Instead of the slides carrying a head and tool post, it is bored out, split and provided with two binding bolts, so as to grasp the tubular arm, which, when loose, may be slid or turned in any position, and then firmly bound in that position. The diameter of the hollow projecting arm need not be much larger than the width of the tool holder—five or six inches—in an ordinary ten-inch or twelve-inch machine. The sliding arm being provided with a featherway and surrounded by a graduated worm-gear or ring feathered to it, the bar may be rotated to any angle and adjusted endwise without disturbing or losing the angle at which it is set. A second advantage of this arrangement would be the removal of the ordinary side projections which so frequently come in the way when using the present machines. I have presented this to show how it is possible in machines of this class to use slides of equal length, maintain their proper position and get adjustment of tool.

The table or platen of a planing machine cannot be used successfully for its entire length unless the bed upon which it runs is longer than itself—usually about one-half longer—and when so arranged and used to any considerable extent on short work it wears the bed concave and itself convex to fit. This would occur even were both absolutely rigid, but is much aggravated by an elastic table, which may be sprung one way or another every time a new piece is secured to it. A rigid table with wearing surfaces so generous as to always float on the oil, however heavy the load, would keep true a long time, or if the wearing surfaces were cut away towards the end of the bed, as shown by this model (see Fig. 4), the result would be practically perfect. If the slide rest of a lathe be long enough, strong enough, has wearing surface enough of the right sort, and the ways were cut away on the plan just shown, it would remain true.

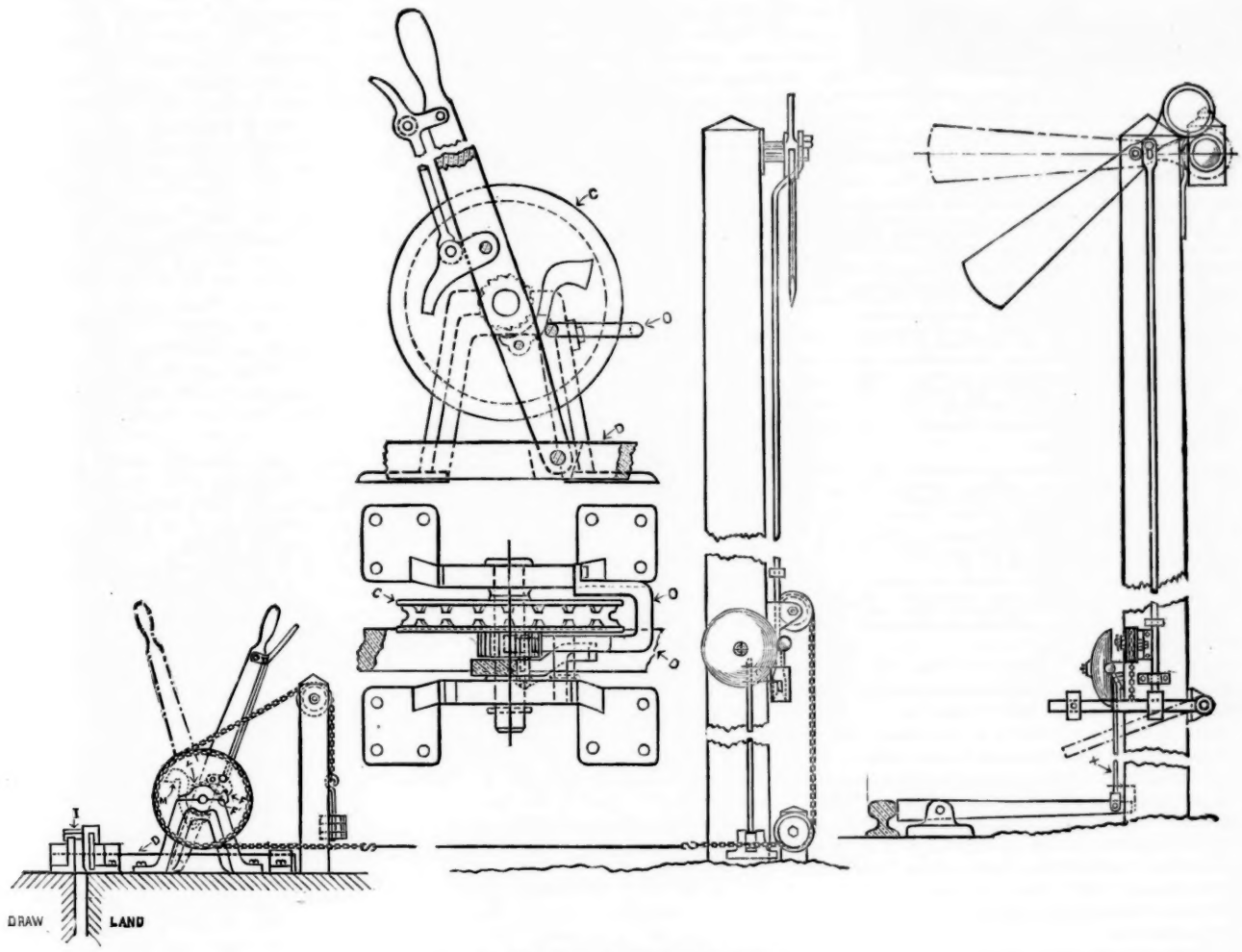
Journals with end play should have bearings and box of the same length: collars, or the bosses, on wheels that resist end thrust on shafts, should rest upon or run against bosses of exactly their own diameter. The guides or slides of steam engines are as often too long as the cross-heads are too short, for one is as fatal to enduring truth as the other.

The framing must be suitable, strong enough, rigid enough (entirely a different quality), readily made and machined; and, last but not least, it must look right.

Per Diem Car Service.

In connection with the subject of per diem car service, and discussing the best way to bring about the needed reform, the Official Railway Equipment Guide prints a form for compiling statistics for convenient comparison, to enable officers interested to readily see and apprehend the comparative value or advantage of the old and new systems. This form is substantially the same as that followed in the compilation of the statistics which have been shown in the *Railroad Gazette*, and we reprint it on this page as being of value for reference. The Official Equipment Guide urges all car accountants to make up statistics of this kind, and it is to be hoped that many roads will follow this advice. The coming convention of the Car Accountants at Montreal will no doubt bring out valuable information and discussion.

The Illinois Central, the West Shore, the Chicago & West Michigan and the Western New York & Pennsylvania discontinued the combined per diem and mileage system on June 1.



THE KELSEY DRAW-BRIDGE SIGNAL.

As Applied at the Middletown Draw, New York, New Haven & Hartford.

The Kelsey Draw-bridge Signal.

The illustrations herewith show general elevations of the signal, the lever and connections, and on a larger scale a plan and elevation of the lever and wheel. The signal is shown at clear. When the lever is thrown over to the position shown in broken lines, the bolt *D* is withdrawn from the socket, and at the same time the counter-weight on the signal post falls and carries the semaphore to danger. The wire connection between the lever and the post is kept taut by the weight over the pulley near the lever stand. As the draw begins to swing, the latch *I* drops in front of the bolt, and prevents its movement until the draw is again closed and the latch thereby lifted. As the lever moves over to the danger position the pawl engages with the ratchet on the sprocket wheel, and the latter is kept from revolving. When the lever returns to the all clear position the ratchet and pawl are disengaged, and the sprocket wheel becomes a loose pulley. In the arrangement shown the normal position of the signal is clear, but by changing the weights so that the one at the post shall be the heavier, the signal will stand normally at danger.

The gong shown on the post is struck by a hammer connected with the track lever. When the signal is at clear there is no connection between the gong and the track lever. This signal has been in use since April 9 at the Middletown drawbridge of the New York, New Haven & Hartford, Air Line Division, and is said to have been satisfactory. It is designed and made by Mr. F. N. Kelsey, of New Haven, Conn.

THE SCRAP HEAP.

Railroad Traveling in Russia.

The Russia railway restaurant is infinitely superior to anything in France or Germany. Everything is delightfully clean, and cool, and airy. The chairs are of clean white wood. The display of viands is tempting, and the viands themselves are perfection. On boarding the Russian train at the frontier station of Wirballen I was surprised at its superiority to the German train. It was just as if we had suddenly been transported to America. There was the engine, with the huge chimney, the tender piled high with wood. And the cars were all like those in Switzerland and in the States, without compartments and communicating, so that the train can be traversed when in motion from end to end. The engine fire is fed by two firemen, who are kept pretty busy heaving logs into the furnace. The maw of the steam fiend is capacious, and the woodpile on the tender diminishes amain. The smell of the burning wood is pleasant to the nostril, a faint piquant flavor of pine woods in spring time is liberated by the fire. At night the sparks fly fast from the funnel, but of black smoke there is none

The wayside stations in Russia are more picturesque than those of Western Europe. They seem all to be built of one pattern. They are of wood, of course. Russia is the country of wood, as distinguished from the countries of stone; just as it is the country of the plain as distinguished from the countries of the mountain. The wayside railway stations are one-story buildings, neatly and simply built. They are roofed with thin sheet iron, painted a reddy brown. At first it is difficult to distinguish the iron from shingles. But when, as is sometimes the case, it is painted green to resemble verdigris, the iron is distinguishable. At every station there are three objects conspicuous in the front of the building; a clock, a bell and a large thermometer. A station without the three would not be Russian; but if by any chance one were missing it would not be the thermometer. What stories of piercing cold and blazing heat the mere presence of that silent recorder of temperature tells! In addition to the three stationary objects on the wall of the station there is on the platform the gendarme, with his white stiff plume on his head, his spurs on his heel, his pistol under his right hand, his sword under his left. He stands almost as motionless as the water-butt from which travelers can drink—a practice probably more common in summer than in winter, for I never saw any passenger alight for that purpose. There is also the metallic gong on which the approach of the train is signaled from the previous station.

I was rather amused to see the abacus in the station as an apparently indispensable appendage to the calculation of charges. It consisted of twelve wires, ten of which contained eight white beads and two black and two of four beads.

The sleeping cars give the most comfortable traveling imaginable. The sleeping car was about twenty paces in length, traversed throughout by a long corridor at one side of the car, out of which opened six rooms, each capable of accommodating four sleepers in the double tiers of berths. At each end of the car was a lavatory. Opposite each door the corridor was pierced for windows, and every sash was filled with double windows of plate glass. The sleeping car, which might have accommodated twenty-four passengers, was only occupied by four, so that each of us had, if he pleased, a compartment to himself. Each compartment was tastefully papered and upholstered with crimson velvet, and supplied with a somewhat imposing lamp. A small table, which was constructed so as to be used for steps by which to reach the upper berths, was very convenient for writing on, and the motion of the train was so steady that you could write with little difficulty. There are only two additions to be made to the sleeping cars on the Russian lines to render them perfect. They ought to be furnished, as are those in Germany, with a map of the country through which they pass; and, considering the polyglot nature of the travelers who use them, the notices and instructions should be printed in at least one other language than Russian. It might also be as well if the attendant, who in our car was as trusty and as attentive as could be, should be able to speak some other language than his native Russian. These, however, are but trifles. Touch the electric bell, and the attendant appears instantly, ready to make up your bed, bring you tea, supply you with towels, or give you any information you may require, provided always that you are capable of imbibing it in the language of Muscovy.—*Pall Mall Gazette.*

Heavy Literature.

The Travelers' Official Railway Guide, each copy of which weighs 14⅛ ounces, and may therefore be justly classed among the most "solid" periodical literature, recently printed the following evidence in substantiation of its claim to be counted the largest periodical now published,

"An article on *Bradshaw's* [English] *Railway Guide* in the *Cornhill Magazine*, says: "An ordinary page of a novel contains about 25 lines, each line holding from 8 to 10 words; so each page may be set down roughly as containing say 300 words. But a page of *Bradshaw* contains some 80 lines, each line having about 40 characters; the whole, therefore, displays about 3,000 characters, and is therefore equivalent to some 10 pages of the novel. Four hundred pages of the guide would be equivalent to say 4,000 pages of a novel, and as an ordinary novel 'runs' to three volumes of 300 pages each, this manual will be found to contain the matter of some 12 octavo volumes. There are besides 60 pages of advertisements, equivalent at least to a couple of volumes more."

"The May issue of the *Official Railway Guide* contains 558 pages of maps and time-tables, of which number 102 pages are filled with maps; there being 8 maps of 2 pages, 16 of 1 page each, 21 of ½ page each, and the remainder in odd sizes; 456 pages are occupied by time-tables or other similar matter. Each page in the *Guide* contains a little over 2¼ times as much matter as a page of *Bradshaw*. There being 56 more pages of time-tables in the *Official Guide* than in *Bradshaw's*, our book is a little over 2½ times as large as that publication. The time-table pages of each issue are therefore equivalent to 30 of the octavo volumes of which *Bradshaw's* is equivalent to 12.

"The entire number of pages in the May issue of the *Official Guide* is 730, and these are equivalent to within a small fraction of 50 of the same octavo volumes. The 12 months' numbers of the *Official Guide* are therefore equivalent to the issue of two octavo volume novels, of 300 pages each, for every working day throughout the entire year.

"In addition to the *Official Guide* there is also published at this office the pocket edition of the same, called the *Travelers' Ready-Reference Guide*, popularly known as "The Red Book," which has 274 time-table pages, each page containing just 50 per cent. more type than a page of *Bradshaw's Guide*. The amount of matter in "The Red Book" is therefore a trifle greater than the contents of *Bradshaw*, disregarding the size of the type used.

"The *Official Guide* announces that the annual subscription price will hereafter be $5 instead of $4. It says: "When the rate of $4 was established in January, 1875, the book contained 308 pages; it now contains 730 pages; the Index of Stations occupied 23 pages; it now requires 64 pages. Notwithstanding this, we have been able to retain the former subscription price, owing to the coincident decrease in the price of paper. This, however, has reached its limit, and the increase named has become imperatively necessary. The subscription price of the *Official Guide* remains as heretofore, cheaper than that of any other publication in the world containing even approximately an equivalent amount of matter. The retail price for single copies will be continued at 50 cents per copy."

The Tarantula.

A large tarantula was let loose accidentally on a train going from Hot Springs to Louisville, Ky., the other day. Women went into hysterics, men used cuss-words, and confusion reigned for half an hour, when the tarantula was cornered and captured by its owner.—*Exchange.* [There would seem to be a demand for palace stock cars in the South. Thirty-four foot cars would, no doubt, be granted to tarantulas without extra charge, even in L. C. L. lots.]

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

About two months ago, the Iowa Railroad Commission was made elective. In our issue of April 27, we predicted what would be the effect of this change. "There are four hundred thousand voters in the state of Iowa; there are not a thousand persons in the state who hold railroad stock. By deciding a doubtful point in favor of the Iowa shipper, there are four hundred votes to be gained for one to be lost." It was easy to foretell what would be the chance of any fair or impartial decisions under these circumstances. What has been the actual result is described at greater length in another column.

It will be seen from our report of the proceedings at the Master Car-Builders' Convention, that considerable attention has been paid to the revision of the rules of interchange, and that, while no very material changes have been made in principle, a committee has been appointed to consider some important points, especially the detailed interpretation of the phrase "brakes in bad order," and the question of the minimum safe size of journals.

The most important modification made in the rules was the addition of a clause recognizing the general use of air-brakes, and providing that cars with air-brake hose or coupling lost or injured may be rejected, or in other words, that air-brake hose is to be recognized as part of the ordinary equipment of a car, and must be kept in order and replaced when necessary. This rule was carried by a large majority, showing that the question of using continuous brakes on freight trains is favorably regarded by the members, and is expected to become general. On one great system, the Atchison, Topeka & Santa Fe, every foreign car not provided with an air brake is temporarily piped. The cost per trip of this temporary piping is estimated at one dollar and a quarter, which is divided pro rata among the roads over which the car runs.

The amendment proposed by Mr. McElwain, and unanimously carried, was also important, and relieves the Executive Committee of the duty of settling disputed cases in the interchange of cars.

The convention has been held under very pleasant conditions, the air being cool and exhilarating, the hotel accommodation good and the attendance the largest known. The position, on a river studded with small islands, entails, however, some inconveniences, and as many members have to sleep on one island, dine on another, and attend the convention on a third, the delights of fresh water navigation consume a great deal of time. The discussions have been very full and the members generally have displayed great energy in improving the rules of interchange, etc., in the smallest details. The discussion on safety appliances was very instructive, and showed the general interest taken in this matter. The good condition of safety appliances is as important as their good design, and the report and discussion threw much light upon both branches of the subject. The report on continuous heating is not yet finally presented, at the time of writing. The tabular statement of the results given in actual practice with the various systems, which is presented on another page, is very full and interesting, and throws considerable light upon the relative merits of the different systems. It is unfortunate, however, that there are no reports from the roads that have used steam heating for the longest period and on a large number of cars. The New York Central, which has equipped several hundred cars with the Martin system, does not give any report, and the Manhattan, which has over 800 cars equipped with the Gold system, and the Maine Central, which has used the Sewall system for some time in a cold climate, are equally silent. It cannot, however, fail to be noticed that, with some exceptions, continuous heating appears to have given very satisfactory results.

The locomotive illustrated in another column marks, in many respects, the progress made in recent years in locomotive construction. A few years ago it would have been deemed impossible to construct a locomotive which could not only successfully burn bituminous slack without throwing fire, but could from such an unpromising material make sufficient steam to haul heavy express trains at a high speed. The use of such an enormous grate area as 76 sq. ft. would also have been deemed impossible. Some years ago, and even now, it is a matter of surprise that such a powerful engine can make steam freely on a heating surface in the flues of only 825 sq. ft. The great value of fire-box heating surface is forcibly shown by the performance of this engine. It may be fairly assumed that this engine makes as much steam as under ordinary conditions could be obtained from an engine with 120 ft. of fire-box surface and 1,200 ft. of flue surface. It appears, therefore, that an excess of 55 sq. ft. in the fire-box heating surface makes up for the deficiency of 375 sq. ft. in the flue surface. The additional surface is chiefly in the fire-box crown, and the heating surface is so near the surface of the fire that doubtless the amount of heat radiated is considerable; but even after allowance is made for these favorable conditions, the relative efficiency of fire-box as compared with flue surface is self-evident.

This engine is not only remarkable for the manner in which an apparently worthless fuel is utilized for the most difficult class of work demanded of a locomotive, but for the ample bearing surfaces and strength of all the parts. The weight on the four drivers, 76,000 lbs., was until recently unprecedented, but the demand for greater power and greater adhesion weight makes it likely that these proportions will be followed in many cases. It is to be hoped, however, that a careful examination of bridges and track will be made in all cases before such a weight is allowed on the somewhat closely coupled wheels of a high speed locomotive. The local strain on a bridge must be considerable, and in many cases in excess of the calculated load when the bridge was built, while the effect on weak rails supported by half rotten ties can hardly fail to be disastrous. While such a load may be safe where proper precautions have been observed, it should not be forgotten that while the use of heavy engines enables heavier trains to be hauled, it also necessitates the use of strong bridges and first rate permanent way.

At the meeting of the New York Railroad Club, May 17, Mr. Perry, of the Perry automatic link coupler, in a playful moment said that the change from link and pin couplers to the vertical plane M. C. B. type would cost a company owning 20,000 cars the sum of $10,000,000 in one year; or it would cost the railroads of the United States and Canada $500,000,000 to make the change in a year. That is, he estimates the cost of the change at $500 a car, showing conclusively that the truly economical way of treating the matter would be to burn the old cars and buy new ones with M. C. B. couplers on them. Mr. Van Dorston, a vertical plane man, of the M. C. B. type, takes Mr. Perry seriously, and in a letter which we print on another page, he undertakes to show that it would cost but $7,000,000 more to change the whole freight equipment of the two countries from common link and pin to vertical plane couplers than it would cost to change to *automatic* link and pin couplers. This is on a basis of prices of $22 per car for the vertical plane, and $15 per car for the automatic link and pin coupling. Mr. Perry in his joke assumed $500 per car as the cost of changing. Why did he not take any other figure, as, for example, $250 or $1,000, he only knows. There is in his paper no clue to the process by which he arrived at the figure which he assumed. In fact, it is entirely aside from the mark to discuss the cost of refitting the entire freight equipment of the country, or of any one line, in one year, for no one supposes any thing of the kind is to be done. If there were no other reason against it, it would be physically impossible. As new cars are built, or as old ones go into the shops for repairs, they will be re-equipped, and the added cost of applying the M. C. B. coupler will hardly be more than the difference in cost between vertical plane, and link and pin couplers, or say about $13 per car as compared with the ordinary link and pin, or $10 as compared with an automatic link and pin. That is, a railroad putting couplers on 2,000 new and repaired cars in a year would pay out about $26,000 as the extra cost for M. C. B. couplers; and without going into statistics it is safe to say that the saving in lost links and pins and in break-in-two accidents would be a very handsome interest on the outlay. Of course, when changes are made in the car timbers the cost of re-equipping will be more, but we have already given more space to Mr. Perry's pleasantry than it really merits and we will not pursue it into all its possible ramifications.

The article in another column on automatic signals on the Fitchburg road discloses the somewhat remarkable fact that, although the system is apparently more simple in the manner of its operation than the clockwork signals, they appear not to work as well, there being one failure to each 365 operations, against one failure to each 1,293 operations of the disk signals, or a difference of nearly four to one in favor of the latter. This appears too great to be merely accidental at the time the comparison was made. It would seem to indicate that there must be some fault of construction or of maintenance to make such a difference in the direction exactly opposite to that which one would expect from an examination of the two systems. The position of the signal in the different classes of failures is not indicated, but it is safe to say that in the very large majority of cases, possibly in all, the signal stood at danger. The form of this signal is certainly superior to that of the clockwork signal, and the indication can be seen for a much longer distance. It is very desirable that there should be uniformity in the style and indication of all the signals on the line of a railroad. The Fitchburg has at various points interlocking signals; these are all semaphores, and it is a step in the right direction to make the automatic signals of the same form. Another improvement would be the adoption by the different railroads of the same system, when it shall have been determined which of these affords the most complete protection, so that on all roads the indications of a signal may be interpreted in the same way. There might then be developed a science of railroad signaling; at present, each general manager or chief engineer or other officer to whose department the signals are supposed to most properly belong carries out his own notion of what should be put up and how it should be used, with little reference to what experience has shown best and safest; and the present miscellaneous collection is the result. It would almost seem to one not conversant with the facts that each road was, by previous arrangement, designated as the field of experiment of some one system, with the view of tabulating and arranging the results, that the most perfect system might be found. This *ought* to be the outcome of the experience thus far gained, but it is too much to hope that anything of the kind will take place until railroad managers are better agreed as to what it is desirable a signal should be and what it should do. It is quite possible that legislative enactment may sooner or later hasten their decision, but it would be far better, as well as more economical, if those in authority would take steps to find this out without waiting till it is no longer a matter of choice.

Marine Practice and Locomotive Construction.

Suggestions for improvements in one branch of mechanics can often be obtained by observing what has been effected in another and often totally different class of machinery, and few locomotive constructors will fail to receive some useful lesson from inquiring into recent progress in stationary or marine engines. The progress in the latter branch of mechanical engineering has been so rapid and so recent that it has created great interest, and it seems possible that some useful lesson may be gained by examining the means by which steamships are now propelled at speeds which are ever on the increase and with an economy of fuel which is unsurpassed on shore.

The advance made in diminishing the dead weight of marine engines and boilers per unit of power developed is forcibly shown in the Magicienne, the latest English cruiser, just launched on the Clyde. While the early ironclads had little more than 0.6 I. H. P. per ton of displacement, the Magicienne has

9,000 I. H. P. on 3,000 tons displacement. The engines are triple expansion, and have horizontal cylinders 34½ in., 51 in. and 76½ in. diameter by 36 in. stroke. The four double-ended boilers have 24 Fox corrugated furnaces, and work at 155 lbs. pressure. The total grate area is 456 ft., or about 1 sq. ft. of grate to 20 I. H. P. This is approaching the proportions found in locomotive practice, for while a bituminous coal-burning engine will develope more than 400 I. H. P. from 20 sq. ft. of grate, a Wootten grate of 72 sq. in. area will not develop much more than 800 I. H. P., or say 11 I. H. P. per ft. of grate. Fifty years ago marine engines weighed about 1,500 lbs. per I. H. P., but in the latest examples the weight has been reduced to 82 lbs. per I. H. P.

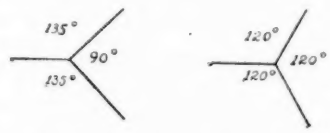
This is but little more than the weight of corresponding portions of a modern passenger locomotive. Taking such an engine as weighing 105,000 lbs. and indicating 800 I. H. P., the weight per I. H. P. is 131 lbs. But this is hardly a fair comparison, as a large portion of the weight of a locomotive is in the running gear, which does not add to the efficiency of the locomotive as an engine, but simply enables it to run on a railroad. If we suppose a locomotive placed on board ship to drive the propeller or set up in a mill to run the shafting, it is obvious that the truck, pilot, wheels, springs, equalizers, hind axles and boxes, cab, headlight, bell, sandboxes, etc., could be dispensed with, while the frame could be materially reduced in length, as the supports for the boilers, etc., form part of the hull of a ship. Even after making some allowance for the weight of the long propeller shaft and bearings and the propeller itself, the equivalent weight in locomotive practice may be taken at about 60,000 lbs., which gives 75 lbs. per I. H. P., or about 10 per cent. less than the proportion of weight to power found in the latest marine engines. The marine engine has, however, several solid advantages to compensate for this excess of weight. The bearing surfaces are all proportionately larger, and the addition of condenser and air pumps, etc., which adds considerable weight, render the engine much more economical in the consumption of fuel.

The means by which the marine engine has both been rendered lighter and more economical in fuel per unit of power developed, forms an interesting study for those engaged in designing locomotives. The use of higher pressures and triple expansion engines has enabled 1 lb. of coal or 1 lb. of steam to do considerably more work than heretofore, and therefore, the amount of heating surface required for a given power has been largely diminished. This partly accounts for the reduction in the weight of the boilers, and lately the quicker and possibly more complete combustion produced by forced draft has still further enabled the size of the boilers to be reduced. The weight of the engines has been diminished partly by the substitution of wrought steel for wrought iron, and cast steel for cast iron, and partly by the use of higher piston speeds, while the development of the principle of compounding has shown that it possesses a considerable advantage in giving a more equal strain on the shaft and moving parts at all points of the revolution. The turning moment being more regular, the engine runs more smoothly and the maximum strains being less, while the average strain remains unaltered, the dimensions of the working parts can be reduced without any injurious effect.

The importance of an even turning force on the driving-axle of a locomotive has never received much attention, though if it has proved of so much importance in running a marine engine, it is possible that it would be also important in a locomotive. If the turning force at one point of the revolution considerably exceeds that at other points, it is evident that the engine will tend to slip, and moreover, as the maximum must be attended with corresponding minimum, the turning force at one point of the revolution must be below that necessary to haul the train. The uneven jerky motion produced when an engine is starting a train, is evidence of this uneven turning force.

The advantages which may be expected from a more even turning force in a locomotive are threefold. The tendency to slip may be diminished, the more even tractive force of the engine reduces the chance of breaking draw gear, and the more even character of the pressure on the crank pins and other working parts of the engine conduces to their longer life. The two former features are obviously of most value when the engine is starting or working in full gear, as then the tendency to slip is greatest and most likely to jerk the train and strain the couplings severely. It is obvious that in an ordinary locomotive little can be done to modify the form of the diagram or the pressure on the pistons during the stroke. The diagram in full gear is nearly a rectangle, and no material modification can be effected by any valve gear. The form of the diagram even in full gear may, however, be modified by the use of compound engines, and the resultant turning moment on the crank pin may be also modified by the use of an engine with three cranks. Both these modifications are extensively used in marine engines and with considerable success.

The addition of a third cylinder, giving three crank pins, set in either of the methods indicated below, has often been proposed for locomotives, and has indeed been tried on a small scale. Experience with marine



engines justifies a belief that such an arrangement would give a far more even turning power on the axle, even if no modification were made, in order to give a more even pressure of steam on the pistons throughout the stroke.

A marine engine and a locomotive, however, work under such widely differing conditions that considerable caution is needed in applying marine practice in locomotive construction. One of the most essential points of difference is the fact that marine engines work practically always at the same speed and with a nearly uniform grade of expansion. It is, therefore, possible that the compound system, where the valve gear may be arranged to give the best possible diagram at one particular speed may not be sufficiently elastic to suit the varying speeds and power required of a locomotive. While, however, the application of the compound system to locomotives presents peculiar difficulties in this and other respects, it would appear from the gradually increasing use of compound locomotives that these difficulties are by no means insuperable. The compound engine appears especially suitable for freight engines, mainly because a compound locomotive when in full gear is working with a nearly three-fold expansion, while an ordinary locomotive is working with very little expansion. Thus a great economy is effected in starting a train, and consequently the economy of compound locomotives has been most marked where they are working freight and way trains. Compound locomotives also possess certain other advantages when running at a moderate speed. The fact that the lessened range of temperature in each cylinder diminishes cylinder condensation and re-evaporation, is the most valuable feature in the compound principle, but the smaller variation in the pressure on the pistons is also an important point.

A simple engine when working expansively gives a very varying pressure on the piston, and with the great compression in an engine running at high speed, the pressure on the piston at one end of the stroke is negative, nearly all the effective work being done on the first half of the stroke. At very high speed this is, to a great extent, necessary, in order to overcome the inertia of the working parts, but it is really not needed in freight engines. This excessive difference in the pressure on the piston at different parts of the stroke, when the engine is running fast, can be overcome by the useof the compound system, and a suitable proportion of the valve gear, etc., gives a more even pressure throughout the stroke, and an amount of compression which is just sufficient to arrest the motion of the piston, while the excess of initial pressure is sufficient to start the piston into motion at the beginning of the stroke.

Automatic Signals.

It is contended by the opponents of automatic signals that even in their most perfect state there will be occasional failures, and that a single such failure may cause a disaster; that the use of a system open to such a possibility is hazardous and unwise; that the delays caused by the frequent stopping of trains unnecessarily, or even for preceding trains in the section, is a serious impediment to the prompt and regular operation of the road, and a source of as great or greater danger than that against which the signals are supposed to guard. Those, however, who have had most experience with automatic signals are least inclined to admit the conclusiveness of these objections. They do, indeed, have to enforce very strict discipline. Enginemen have to be closely watched and made to obey the rules about stopping when signals are deranged, or give false indications of danger. But there is little danger of having too much of this kind of discipline; and to successfully work a crowded line without block signals, either automatic or non-automatic, requires even stricter discipline.

The most perfect and the safest form of block signals would combine the good points of both systems. Such a signal should go to danger automatically whenever any portion of a train entered the section at any point, and it should be impossible to set the signal clear for another train to enter the same section until the first has entirely passed out. When this is the case, and it has been so certified by the man at the end of the section, by unlocking a lever or by some other action, his ability to perform which is made absolutely dependent upon the passage of the rear of the train at the point from which the unlocking is done or signal given, the man at the beginning of the section may let another train enter. Until this has been done, it should be out of his power to lower the signal. But such a system as this would be far more costly than the automatic signals now in service, and that alone might be a complete bar to its use. "Half a loaf is better than no bread;" and if the ideal system cannot be had, there may be comparative safety in the judicious use of automatic signals when a long time might elapse before the traffic or income of the road would warrant the necessary outlay for a complete equipment of block signals. When the latter can be afforded the most valuable features of the automatic system should be incorporated in or combined with it, and the whole work done by one system.

When the traffic of a line so largely increases that trains are frequently stopped by previous trains in the section, and a new element of danger is introduced on account of such stops, the obvious and simple remedy up to a certain limit is to make the block sections shorter, and one of the most valuable features of a good system of automatic signals is the facility with which it can be adapted to changes of conditions. At first, while the number of trains is limited, signals every mile apart may be sufficient; as the number of trains increases they will be needed every half mile. This requires no change in the position or use of those already there, but simply the interpolation of others between them. When the traffic so increases that this is found insufficient, still others can be put in as near each other as circumstances may require. There is an increased cost in plant and some increase in cost of maintenance, but the operating expenses are not increased as by the duplication of non-automatic signals. It follows that with the automatic there is more likelihood of adequately increasing the signaling as traffic increases than with non-automatic.

Used with proper safeguards, that is, always assuming danger unless the signal shows all clear for an approaching train, *and is seen to operate for that train*, an accident due to the failure of an automatic signal is practically impossible. Nevertheless, the roads which use the automatic have never relaxed their rules about flagging, and we believe none of them permit trains to regularly follow one another in less than five minutes. The critical period with an automatic block system comes when traffic increases to such an extent as to require trains to be run oftener than this. With a five minute interval, an alert flagman is generally a sufficient reliance for safety (though there are a great many places where this is practically a scant interval); but when we reduce the headway to three, two, or less, any idea of protecting trains by sending back a man any considerable distance must be abandoned. With block signals worked on the absolute plan and *in good working order* a flagman is wholly unnecessary. If the engineman on approaching an automatic signal finds it at "all clear" he has an evidence that the electric current is alive the whole length of the block, and if the runner of the previous train has done his duty this clear signal is evidence that the electro magnets have worked since the passage of that train. If an engineman sees a signal go to danger as he passes it he has positive evidence that the rear of his own train is protected. About the only failures that we remember to have heard specified as likely to cause a signal to show clear when it should show danger are, frozen outdoor apparatus and armatures sticking (failing to fall by gravity when the current ceases). The requirement that the runner must see the movement would seem to provide against these difficulties.

But supposing the signal does not work and the train has to stop, what then? It will not do to go on leaving the signal showing clear. If a flagman is dropped, what shall he tell the following train? Even after he has posted the following runner it will not do for him to permit the train to proceed within less than five, eight or ten minutes; for, having no telegraphic communication with the next signal he must allow his own train time to send a flagman back in case of any further unexpected stops. He

would have to stay there and keep all trains a prescribed interval apart, and there would have to be well understood regulations concerning the method by which he should convey this information, and the reason for it, intelligently; and he ought to have easy and unmistakable arrangements for notifying the nearest telegraph office.

Perhaps, however, these questions are not so practical as that dealing with signals that show *danger* wrongfully. Most derangements or failures set the signal red; what is to be done with these cases? Trains must not stand an indefinite time waiting for a frozen or dried up battery to work. The speed certainly must be kept under control to the next signal, as there is often no telling whether the previous train has been gone 30 seconds or 30 minutes. Apparently here, as under the other circumstances, a time interval would have to be established. Is it necessary in this case to leave a man? If a number of trains are closely following, they can each wait the prescribed interval on reaching the deranged signal, and then proceed cautiously through the next block and at full speed thereafter, or until a station is reached or signals in good order are met with; but if trains are following only at long intervals each one of them would waste several minutes waiting unnecessarily. All these contingencies tend to indicate that flagmen well loaded with "Rule 99" must be still kept in service, and that entire dependence on signals so that trains can be run on crowded lines with only one brakeman (who never goes back), as is done in England, will not be practiced with automatic signals for some time to come.

We have gone thus minutely into the considerations bearing on this subject, that officers who have not examined it carefully may be led to look into it. Roads having many trains that follow each other within less than five minutes will doubtless generally have block signals, attended by men, whatever perfection is attained by automatic devices, so that the latter are more likely to be used by those roads where most of the trains are spaced ten minutes or more apart and a real necessity for the block system as a hastener of traffic exists only occasionally, or for a very small portion of each day. This being the case, perhaps the eliminating of the flagman is not a pressing question on the great majority of the roads of the country; and the small cost of introducing and maintaining automatic signals, as compared with signals which require the constant attendance of a man at each end of the block, and the reliability of the indications of automatic signals when properly constructed and cared for make them available as an auxiliary in conditions where the non-automatic block system is considered too costly.

Iowa Rates.

The situation in Iowa continues confused and discouraging. Owners of railroad securities are at a loss what to do, and traffic managers are perplexed at the variety of interests involved and the great number of entanglements which are encountered in every attempt to take a step in any direction. Much information and misinformation has been telegraphed over the country by the newspapers, which has served to make the uncertainty worse. It is well to keep in mind the main facts. The passage of the Inter-state Commerce law, while reducing tariffs in some cases so as to bring local rates nearer to a proportion of the through, had the effect also of necessitating the abolition of many special freight rates which favored Iowa jobbers. This latter feature was largely instrumental in renewing the anti-railroad agitation in the Iowa Legislature, and the last law passed upon the subject, which we have heretofore referred to, placed additional powers in the hands of the railroad commission and imposed important limitations on both passenger and freight rates. The result of this law was that both freight and passenger tariffs had to be generally amended. In some cases the rates were necessarily reduced, and in others when the road in question formed the long line between two points the rates were raised so as to equal the sum of the various local rates between intermediate points. This increase would deprive the road of more or less business, the rates being based upon the shortest route between the points in question, and a provision in the law also claimed control of all business which both originated and ended in the state, even though it went through other states in transit. A curious instance of the working of the law may, for example, be found in the ticket rates between Keokuk and Ottumwa. The short route is by the Rock Island road, running entirely within the state. Business has been done in the past between these two points over the Keokuk & Western and the Wabash Western, the route lying mainly in Missouri. Now, however, being the long route, the rate Keokuk to Ottumwa, made by the short line, cannot be met without cutting under the rates between intermediate points, which is against the law. The roads in question have accordingly to give up this particular business.

To add to the complication the Iowa Railroad Commissioners have taken advantage of the powers vested in them by the new law to prepare a new freight distance tariff, making, in many cases, reductions of 30 to 40 per cent. below the lately adjusted figures. The managers and freight agents of the various lines interested have remonstrated, but as yet without effect. The new rates proposed are lower than those of the latest Illinois tariff, and on many articles it is difficult to see where any net revenue will accrue to the roads. Iowa local rates suffer additional complication from the demoralized condition of affairs between Chicago and St. Paul, local Iowa points on Chicago-St. Paul lines which pass through that state being affected by the low through rates, while at the same time they must, according to the state law, be kept on an equality with all other local rates in the state.

Annual Reports.

Rock Island.—From a summary of the annual report for the year ending March 31 we obtain the following figures:

	1887.	1886.
Miles operated	1,527	1,384
Earnings, passenger	$3,489,501	$3 097,016
" freight	8,801,354	8,037,453
Total, including miscellaneous	13.509,727	12,319,050
Operating expenses	8,742,060	7,504,809
Net earnings	4.767,667	4,814,241

Unfortunately there has been a great change in the financial position of the company, which leaves them with a virtual deficit instead of surplus.

	1887.	1886.
Net earnings	$4,767, 67	$4,184,240
Other income	413,170	230,000
Total income	$5,180,837	$5,044,240
Interest	1,810,778	1,320,667
Rentals	617,788	474,684
Dividends	3,010,518	2,937,186
Deficit	258,247	
Surplus		311,703

In one respect this showing is unfair to the company, since it charges against it the interest on the extensions (Chicago, Kansas & Nebraska Railway), which have not as yet brought in any appreciable return. But the method adopted by the officials of the company to conceal this deficit is still more unfair. They count a premium of $844,000 on bonds sold as income and thus convert a deficit of $258,000 into a surplus of $586,000. If we compromise by counting neither the premium nor the added interest charges on unproductive property, the current receipts and disbursements nearly balance.

We are sorry to note that of the increase in operating expenses a large part of the burden falls upon the item of Transportation Expenses. These have increased from $4,033,000 to $4,897,000, or more than 22 per cent. This is not only much faster than the earnings have increased, but faster than the change in passenger or ton-mileage will warrant. The former has increased from 133,000,000 to 143,000,000, or not quite 8 per cent.; the latter from 794,000,000 to 942,000,000, or about 19 per cent. The increased cost per unit of traffic does not indicate good economy.

The receipts per passenger mile were 2.336 cents in 1887, against 2.328 cents in 1886; per ton mile, 0.93 cent in 1887, against 1.01 cents in 1886.

The capital account has increased from $81,473,000 to $99,254,000. There has been an increase of a little more than $4,000,000 and over $12,000,000 of bonds. The sums thus obtained have been largely used for advances to the Chicago, Kansas & Nebraska Railway, by which the company has obtained control of 113 miles of line.

Pittsburgh, Ft. Wayne & Chicago.—This road being under lease, its report is almost exclusively financial.

In the year 1886, the revenue derived by the Pennsylvania Co. under the lease little more than paid rental and interest, and was hardly sufficient to meet sinking fund requirements. The report for 1887 shows a change for the better, of $878,000.

	1887.	1886.
Gross earnings	$11.269,953	$9,116,312
Operating expenses	6,988,028	5 847,062
Net earnings	4,281,925	3,269,250
Net earnings after adjustment with other companies	3.959,229	3,080.399

Out of this sum there has been paid under the lease $3,054,780, leaving a net gain for the year of $904,449; or, after deducting sinking fund payments of $104,100, a net gain to the lessee of $800,349.

Chicago & West Michigan.—This is a remarkably full and clear report.

	1887.	1886.
Miles operated	414	414
Earnings, freight	$890.437	$870.503
Pa-s	454 911	456,310
Total, incl. misc	$1,414,022	$1,395,979
Operating expenses	1,064,629	1,025,497
Net earnings	$349,393	$370,482

Out of this sum was paid interest, $220,000, and dividends (2 per cent.), leaving as the year's surplus $6,000.

In the account of operations we find a decided falling off in passengers and in tonnage, but an increased average haul. In the case of freight this has grown from 62.33 miles in 1886 to 67.96 in 1887. Ton-mile charges have diminished, passenger-mile charges increased.

The chief item of charge in operating expenses is under the head of car maintenance—$160,000 in 1887, against $113,000 in 1886. Bonded debt has been increased $146,000; nearly all the proceeds were spent for new equipment. A survey has been completed for an extension, 74 miles in length, from Baldwin to Traverse City, through a region at present covered with hard wood timber, and likely to furnish valuable lumber traffic.

St. Louis, Alton & Terre Haute.—This system consists of three parts, 193 miles owned but not operated, 14 miles owned and operated, 174 miles operated but not owned.

The first of these, extending from east St. Louis to Terre Haute, is leased to the Indianapolis & St. Louis and the C., C., C. & I. jointly, at a fixed rental of $450,000, subject only to the expenses of litigation which are usual in such cases. The gross earnings on this part of the system were $1,508,000; a larger sum than in any year since 1870, though the excess over 1882 is but trifling.

On the 188 miles of line operated we have the following figures:

	1887.	1886.
Miles operated	188	138
Earnings, passenger	$161,306	$137,561
" freight	745,925	616,430
Total, includ. misc	$962,480	$803,991
Operating expenses	521,079	408,899
Net earnings	$441,401	$395,095

Of the last sum $255,882 was expended for rentals, leaving $185,519 net. Adding to this the main line rental of $450,000 and $2,437 other receipts, we have an aggregate income of $637,956, which after paying interest charges, betterments to the amount $31,850, and $75,000 of the floating debt, left a year's surplus of about $49,000.

The increase of earnings and expenses is due to the increased mileage rather than to any other cause. Further extensions are proposed for the coming year. The extension of the St. Louis Southern will be completed in the fall of this year. It will be about 54 miles long, and will form the most direct line from Paducah to Chicago, St. Louis and the Northwest. This road is practically being built under the supervision of the St. L., A. & T. H., which will have complete control of its business.

The construction of this line is not the result of any dissatisfaction incident to, or disturbance of business relations with, the Illinois Central Railroad." But the local interests of this part of Southern Illinois have long demanded a rail outlet, and other parties, adverse to this and the Illinois Central companies, had commenced building a road that would doubtless have developed into a competitor to both roads. The measure is therefore largely in defense of the interests of the St. L., A. & T. H., as well as those of the Illinois Centrala, hence it expects to continue friendly relations and interchange business with that road without interruption, although the new road will handle some of the business that has heretofore been interchanged with the Illinois Central at Du Quoin. The latter company appreciates the situation, and has been advised throughout of the plans.

The partial abolition of Sunday yard work which we referred to last week, seems to have been received with considerable enthusiasm at Chicago, and to have been undertaken also at other points. A correspondent of the *Railroad Gazette*, who has recently talked with a number of officers in Chicago, sends us the following:

"A Lake Shore & Michigan Southern officer tells me that there is no switching done on Sunday, except that absolutely necessary in the handling of perishable freight and live stock. The engine work in the individual yards, taking care of incoming trains and getting ready for Monday morning, is, of course, unavoidable, but there is absolutely no interchange of ordinary freight between any of the Chicago roads between 6 a. m. Sunday and 6 a. m. Monday. All work which can be rushed out of the way during Saturday, day and night, is so handled. So far as practicable, the same rule is observed along the line of the road. The men are allowed to have their forenoon, and plenty of time for dinner before starting out on freights.

It was not customary before this innovation for the men to have any day off except on the "snatch as snatch can" principle. The men got no extra pay for Sunday work beyond the usual week day wages for one additional day. However, they are paid for any "overtime" (more than 10 hours per day) on week days, and a natural sequence of the present scheme will be that when business is lively they will earn as much as they formerly did by working Sundays.

The Chicago & Alton is avoiding all Sunday work possible. In Chicago, Bloomington and East St. Louis yards the practice is the same as the Lake Shore's, and at Kansas City the plan is being gradually introduced. The new arrangement, so far as the officers of the road could plan it, gives the men Sunday with their families at home. Under the old method the man who was caught away from home on Sunday spent as much as his extra day's wages amounted to, so that while he does not actually earn as much by about one-seventh, his expenditures are less by as great a proportion. Besides this he will have more chance to make extra time on week days. The men are pleased with the change and so is the company. The men are more ambitious than formerly and all unite in an effort to handle the business with dispatch and there is actually a great contrast noticeable between the new and old practice. Officers are well pleased too. When much business is being done on Sundays it necessitates the attendance of officials at their posts of duty. Under the present arrangement—except in cases of emergency—superintendents and managers will have no excuse for shirking church or domestic duty.

The good results got by the Pennsylvania Railroad in the use of chilled wheels have been repeatedly noticed in recent publications. In Mr. Ely's letter to the Massachusetts Commissioners, which we published, he said that there were in service about 374,000 wheels made at the Altoona foundry, of which 24,000 were in passenger service and 350,000 in freight. Of these, 1 in 250 were removed from passenger cars, and in 1 in 714 from freight cars in 1887, cracked and broken from all causes. The inspection is very severe, and it is supposed that some of the wheels removed could have been run longer with safety. Moreover, it is the endeavor of the company to make the inspection of freight wheels

as rigid as that of the wheels in passenger service. It is said further that the percentage of failure has been greater with steel-tired wheels than with the Altoona cast-iron wheels, and some of our readers have expressed a desire to know what wheel mixture is used at the Altoona foundry to get so good service. It is as follows. The steel is, we understand, from old rails.

Steel	5 per cent.
Lime rock, Saulsbury charcoal	5 "
Richmond, Saulsbury charcoal	5 "
Lanesboro, Saulsbury charcoal	5 "
Hecla, Hanging Rock charcoal	5 "
Shelby, cnarcoal	5 "
Greenwood, charcoal	5 "
Glendon, anthracite	15 "
Old Altoona wheels	40 "
New Altoona Scrap	10 "
	100 "

It was announced last week that a meeting had been held in New York of the representatives of the roads running Wagner cars, for the purpose of deciding on a form of steam heating coupler to be adopted by all, and that the vote resulted in the choice of the Sewall by 1,980 votes against 1,867 for the Martin. It appears, however, that the Martin had the most votes in the informal and the formal ballots. The votes were by cars, and the following is the report of the ballot given to us by Mr. J. M. Toucey:

Informal Ballot.

Name of road	Martin.	Sewall.	McElroy.
Lake Shore	303	....	....
Fitchburg	....	225	....
New York Central	778	....	....
West Shore	275	....	....
Michigan Central	....	....	282
Boston & Albany	321	....	....
Grand Trunk (did not vote)	....	....	....
Old Colony	....	508	....
Delaware & Hudson Canal Co	....	....	238
C., C., C. & I	187	....	....
Rome, Watertown & Ogdgensburg	139	....	....
	2 006	733	520

Formal Ballot:

Name of road.	Martin.	Sewall.
Grand Trunk (subject to approval)	....	905
Fitchburg (subject to approval)	....	225
Old Colony	....	508
Boston & Albany	321	....
New York Central	778	....
West Shore	275	....
Michigan Central	....	282
C., C., C. & I.	187	....
Lake Shore	306	....
Rome, Watertown & Ogdensburg	139	....
Delaware & Hudson Canal Co	(did not vote)	
Total	2,006	1,980

The error in the first announcement arose from the fact that the vote of the Rome, Watertown & Ogdensburg was not recorded. It is impossible yet to say what will be the actual result of the ballot, for it is subject to the approval of the executive officers of the roads concerned, and the meeting was of the nature of a conference, and its action is not necessarily binding on the various companies. Each of the three couplers represented in the informal ballot has stout advocates amongst those who have used it.

The formation of an association of railroad accounting officers, in accordance with the announcement published in the *Railroad Gazette* last week, is a project which deserves to succeed, and judging from the interest already shown in the matter it will do so. The Committee of Fifteen held a meeting at Chicago, May 30, and were greatly encouraged by the tone of the communications received from roads in all parts of the country. At the meeting in New York, July 25, they hope to see each road represented not only by the head of this department, but by the freight and ticket accountants, and others who have immediate charge of special classes of accounts. There can be but litle doubt that such an association is needed and will be of value. It should be confined strictly to its own business, and, under the leadership of the gentlemen who have already interested themselves in the matter, we have no doubt will be. The more prompt settlement of claims between companies, the elimination of friction in determining balances, either through general officers or at junctions, and the securing of more promptness in all directions, are among the obvious improvements that an association of this kind can help in securing. It can also be made a means of regulating strife at competing points in the matter of giving credit on freight bills and collecting demurrage. The relations of this department to the National government will henceforth be important, and the value of even the temporary organization heretofore effected has already been demonstrated. That organization has undoubtedly aided materially in a correct solution of the problem concerning annual reports which was before the Inter-state Commission. We fear that auditors, like superintendents, are somewhat prone to stick to their own methods and to study those of other people with only the faintest kind of enthusiasm, but the association nevertheless will be a channel through which can be acquired an immense amount of knowledge as to what is being done outside of one's own narrow circle.

NEW PUBLICATIONS.

Notes on the Compressive Resistance of Freestone, Brick Piers, Hydraulic Cements, Mortars, and Concretes. By General Q. A. Gillmore, Ph. D. John Wiley & Sons. $3.50.

This volume is based upon experiments made at the Watertown Arsenal, and described in the report for 1884, published at the Government Printing Office in 1886.

In the introductory chapter a discussion is given of previous experiments, with the intent of showing first, the best packing to be used. These show conclusively that any yielding substance used for packing causes rupture at a lower pressure than an unyielding one; the loss of strength being in some instances as high as 40 per cent. A critical examination of the original results of the Watertown experiments shows a thin layer of plaster-of-paris to be probably the best packing yet tried. The difference in results is found to be last with stone of low strength.

The second point discussed is the question of relative strength of cubes of the same substances of various dimensions, and the empirical rule is deduced, that if a = pressure in pounds which will crush a 1 in. cube, x = side of any other cube, and y = pressure in lbs. per sq. in. required to crush the latter; then

$$y = a\sqrt[3]{x}$$

We are inclined to think that while this may be true for the materials tested, the results with cement cubes do not bear out the rule. However, there may be some other law operating in the latter case, such as a difference in hardness of the interior and exterior.

The two succeeding chapters describe the object of the experiments, the form and sizes of test pieces and character of material, and the exact methods pursued.

Chapter IV. gives tests of Haverstraw freestone. In this chapter the author discusses at length the formula just given, and is obliged to confess that the Watertown experiments do not bear out the rule. He still thinks it might hold if all materials were homogeneous; but the *facts* are that the strengths per square inch of 5-in. and 6-in. cubes of the Haverstraw stone exceeded that of the 1-in. The characteristic rupture by pyramids being formed in the centre from the splitting off of fragments from the outside is shown on page 17.

The strength of slabs or prisms of less height than cubes of the same is discussed, and an empirical formula given; also of a series of slabs of neat Portland cement.

The remainder of this chapter is devoted to the questions of the compression of this material, of the modulus of elasticity and of the resilience. The elastic limit is placed at 65 per cent. of the ultimate resistance, and the average modulus at 956,450 pounds. The original tests were all tabulated with the whole pressure on each specimen, and not reduced to pressures per square inch, hence the curves given in the plates are not comparable. The discussions as to resilience, etc., while showing some value, are dependent on too few tests to be considered as anything more than suggestive.

Chapter V. takes up tests of cements, and discusses the tests in the same manner as for freestone. Dyckerhoff cement neat gave average crushing strength of 5,000 lbs. per sq. in., and the table on page 65 fully bears out the criticism made on the formula given above. The average modulus of elasticity for Dyckerhoff's Portland cement *neat* is given at 1,500,000 lbs.

Chapter VI. treats of other mixtures and other cements; chapter VII. of brick piers, showing crushing strengths averaging 1,851 lbs. per sq. in. of section, with indications of failure at about 80 per cent. of this. The *amount* of compression is stated in the experiments on cement and sandstone, but no discussion of it is given. Chapter VIII. gives a summary of results; and an Appendix with tables of the tests, and a series of plates giving the results graphically close the volume. The information given is not obtainable elsewhere, and the work is a valuable addition to this branch of engineering literature.

Transactions of the American Institute of Mining Engineers. Contents and Index. Vols. I. to XV., inclusive. Published by the Institute. R. W. Raymond, Secretary, 13 Burling Slip, New York.

This volume gives the tables of contents of the published Transactions of the Institute, beginning with the Wilkes-Barre meeting of May, 1871, and ending with the Scranton meeting of February, 1887. This portion of the volume occupies 29 pages; it is followed by 378 pages of alphabetical index, evidently carefully and systematically done. The cross references are numerous, and there are various simple typographical devices which facilitate the use of the index, without confusing the user and burdening his memory. This index makes available a fine body of technical literature, and it is a loss to the world that no similar work has ever been done by the American Society of Civil Engineers. We are informed in the preface that single volumes of the Transactions and a few complete sets are for sale at the office of the Secretary, where a few of the papers in Vol. VIII. and most of those in Vols. IX. to XV. may also be obtained in pamphlet form.

TRADE CATALOGUES.

The catalogue of the *United States Fire Clay Co.*, of Cleveland, O., gives price lists and descriptions, with many illustrations, of their salt-glazed pipe and fittings, fire-brick, flue linings and other fire-clay products, including of course their railroad and road culvert pipe, which has been used for many years. The introduction states that the capacity of the company's works has been increased threefold the past year, and is now 5,000 car-loads per annum.

The Three Styles of the Baker Heater. This is an illustrated catalogue and price-list of heaters and special parts, made by the Baker Heater Co., 549 West Thirty-third street, New York. The fitness of the Baker heater for its work is not to be questioned. Its use on 20,000 cars, and its continual popularity after nearly 20 years of service, are sufficient evidence of that. The agitation of the question of car heating and the sudden growth of a dozen more or less practicable systems of continuous heating have stimulated the Baker Co. to various improvements in details, and notwithstanding local legislation, they still have a large and sufficient field for the use of their heater. Indeed, if there were a thorough understanding of the subject on the part of state legislators, it is probable that the Baker heater in its latest and best form would often be specially exempted from the action of laws against independent heaters, for there is practically no danger of fire from such a device as was shown in the *Railroad Gazette* of April 13. In this form, it will be remembered, the outside case of the heater is of soft steel, with welded joint, and automatic regulation of the draft by which any opening of doors except for firing is unnecessary. In the list of 150 companies given in this catalogue as using the Baker, 13 have in use the new "Fire Proof" form.

Illustrated Catalogue and Price-List of the Sterling Emery Wheel Co., 17 Dey street, New York. This catalogue shows special wheels and fittings adapted to an immense variety of uses. The catalogue proper is prefaced by a short essay on Emery Wheels and Their Uses, and directions for ordering in which are indicated the numbers and grades of wheels appropriate for different purposes. The numbers range from No. 16, for ordinary foundry work, to No. 150, for fine optical and mathematical instruments.

English Accidents.

The British Board of Trade report on accidents, from which we gave extracts last week, is largely taken up with special reports on the more notable accidents. For 1887 there are 34 of these (two-thirds of them being collisions), and they fill the bulk of the book, occupying 130 pages while the statistical tables take only 20.

These reports, which, it will be remembered are compiled by the Board of Trade and published annually, should be of value to and worthy of study by American railroad men, notwithstanding the natural feeling that we have no lively interest in the troubles of railroads 3,000 miles away. The tables we published do indeed show a remarkable record of safety in railroad traveling, but the degree of perfection attained does not have the effect of relaxing further effort, and the special reports, which cover many accidents of a class that American railroad commissioners find themselves unable to take much note of, show that the high standard of the Board of Trade is constantly held up before the railroads in such a way that they cannot ignore it.

In many respects the mistakes and misfortunes of English roads result from causes similar to those which operate here. Questions concerning the management of men and the number of hours they should work; the expediency of expenditures for improvements to prevent accidents, and many others, have bearings which can be studied there as well as here. The density of traffic in England is such that many phases of the art of railroading can be studied better from the practice there than from ours. The Massachusetts Commissioners have made some valuable investigations during the past year, and before that; but they take cognizance of but a small part of the business of this country. The greater part of all human progress has for its foundations the failures and blunders of the past; but, unfortunately, the most instructive blunders and failures in railroad operation in this country are carefully concealed by the perpetrators, or by those who have a tender feeling for them. "Faithful are the wounds of a friend," but wound-inflicting friends are a blessing which railroad managers do not enthusiastically hanker after.

Each of these special reports begins with a description of the train, the surroundings and every conceivable particular, including grades, kind of rail, ballast, etc. This is followed with the evidence of each witness, apparently reported verbatim, though it is all in clear and concise language. The reports conclude with the views and recommendations of the inspector. These inspectors are, it will be remembered, officers detailed from the Royal Engineers, but acting under the authority of the Board of Trade, their positions as inspectors being practically permanent. The reports in the present volume are by Maj.-Gen. C. S. Hutchinson, Col. F. H. Rich and Maj. F. A. Marindin. We quote below some of the more interesting decisions. Some of them are of interest chiefly as affording an opportunity to compare English and American views and practice. Others should be studied with less thought of their doings, lest too much attention to their shortcomings may cause us to forget our own.

In a derailment at Coleraine, Ireland, near a bridge, the circumstances were similar to those of some recent cases here. The rails were not securely fastened and fang bolts are recommended. Guard timbers are neglected, as will be seen from Col. Rich's recommendation that "guide baulks, shod with iron, 4 or 5 in. higher than the rail" be provided. He also recommends that "check rails" (inside guard rails) be placed not over 1¾ in. from inside of rail (on a curve approaching the bridge), instead of 3 in., as was the case in this instance.

At Leith, Scotland, a passenger train was derailed at a facing point switch on a curve by a worn flange which ran inside of the point of a switch rail which was ⅛ in. out of position. The home signal could be lowered when the rail was thus loose, and the cause is indicated in Gen. Hutchinson's recommendation, viz.:

"To guard against the recurrence of a similar accident, the transverse bar between the facing-points—through the holes in which bar the plunger works, and which holes have become worn to the extent of a quarter of an inch—should be replaced by a new one; and a piece of check rail should be fixed in front of the points on the inside rail of the curve to diminish the pressure of the left wheels against the left rail."

At Ellesmere a mixed train, running 15 miles an hour, was derailed at a facing point switch which was arranged to set itself after the passage of a train through it in the opposite direction, but which it failed to do in this case. The road is single track, but through the station yard it is double. Trains entering the station from either direction turn to the left; on passing out they crowd the switch rails apart and the latter are returned to position by the action of a weighted lever. In this case a heavy rain had splashed sand upon the

slide plates, so that the weight did not pull the rails home. Home and distant signals were interlocked with a locking-bar (though not worked from a tower), but a wrought-iron crank lever broke and allowed the signals to be pulled clear without locking the switch. This lever was ½ by 2¼ in., and had an old flaw half through it. Col. Rich says that the interlocking is not up to the best standard, and that until it is improved a man should be stationed at the switch when it is in use. A man who should have examined the switch rail in this case had been on duty 16½ hours, and Col. Rich seems to think that he did not look at it at all.

Twenty-five passengers were injured at Plymouth by a collision, wherein an empty engine ran violently into the rear of a train which it should have coupled to for the purpose of pushing it into a terminal station. The runner of this engine had stooped down to open a split pin that had caught in his trousers some time before; his fireman had got off to turn a switch and the runner did not even know but that he was still on the engine and ready to apply the tender brake. The engine (running backwards) struck the passenger train while the man was still fixing the split key. He was perfectly sober and an old and trusted runner. Col. Rich says:

"His attention was so completely taken up with the split pins, which had nothing to do with the efficacy of his engine, that he never noticed that his fireman had left, and allowed his engine to run down the incline of 1 in 77 toward the Plymouth ticket platform, and did not rise up or think of looking out until his engine ran into the tail of the passenger train that was standing at the ticket platform. This man had been on duty about 6¾ hours when he ran his engine into the passenger train. His daily hours on duty are too long. He commences work at 6:30 a. m., and ends at 9 p. m. For three or four hours during the afternoon he is not actively employed, but he remains about the yard. Although his neglect cannot be attributed to over-fatigue, it conveys a strong impression of how careless some of these men become of their own lives and of the public safety, in the execution of the very responsible duties with which they are intrusted.

"The late collisions at Wath, at Hexthorpe and at Bristol which preceded the present case all point to the desirability, if not absolute necessity, of taking measures to keep engine drivers alert while they are on duty. I have frequently observed drivers of single engines who, while passing through crowded stations, are not looking in the direction in which they are running; and I would suggest to all railway companies the desirability of directing their station masters and inspectors to notice and report any carelessness and want of attention that they may observe. I am convinced, if they will do this, that it will be an advantage to the drivers themselves, and contribute to the safety of the traveling public."

In the case of a derailment at Aviemore, on the Highland Railway, where a passenger train running about 35 miles an hour ran off the track on entering a station loop (the double track arrangement mentioned above) where the curve was 1,650 ft. radius and the super-elevation calculated for 25 miles an hour, Maj. Marindin says that the high speed was the cause of the accident. He continues:

"In 1884, in consequence of an accident at the entrance to the station loop at Kildonan, an order was issued limiting the speed to 15 miles an hour when passing over facing points at stations where trains do not stop; but this order, issued on April 14, 1884, was cancelled for all stations on the line except three by another order issued on June 23, 1884, and the old working was reverted to, under rules which merely enjoin 'Caution' when approaching and passing stations where there are facing points. I am informed that the reason for this speedy step in a retrograde direction was simply that it was found that under the new rule trains could not perform their journeys in the time allowed, but if the company considered the new rule to be necessary for safety, as may be assumed from the fact of their issuing it, the reason for cancelling it would seem to be a bad one, as it would make it appear that the safety of passengers was only a secondary consideration.

"As the rules stand it is a mockery to tell the driver that he must pass over facing-points with 'great caution,' and then to time his train so that he must run through station loops at a speed of at least 35 miles an hour. The escape from any serious consequences in the accident under consideration was most remarkable, and I trust that the lesson to be learnt from it will not for that reason be lost sight of."

At Manchester, on the London & Northwestern, a passenger train collided with another on entering the station by reason of a signalman giving an empty passenger train leave to move *without lowering the interlocked signal*. He gave this leave by telephone and another man in the same tower gave a conflicting signal. General Hutchinson says the power brake was inefficient, and criticises the employment of two men in a signal cabin with no fixed division of authority or duties. One or the other should be in responsible charge.

At Waterloo, on the London & Southwestern, one night about 10 o'clock the runner of an empty engine was given a signal to go ahead, back through a cross-over, and be ready to start for Nine Elms. Instead of backing across he continued straight on, on the wrong track, and collided with another train. It is a four-track road, and the runner was overtaken by another train on one of the parallel tracks, but he did not come to his senses even then. He claims that he then was looking into the fire-box, which Maj. Marindin says "was not a judicious thing to do." The report says that the signal which the engineer mistook, and which was a switching signal, was a regular semaphore, the same as the speed-route signals; it should be a disk signal, leaving regular semaphores to be used exclusively for "right-away" signals (giving permission to leave the station).

At Dodworth, on the Manchester, Sheffield & Lincolnshire, another case similar to this occurred. An empty engine should have been let through a cross-over, but, by an inexplicable mistake of the signalman, was not; he probably pulled the lever and then replaced it before the engine reached the switch; the engine ran 1¼ miles on the wrong track and met a freight. The night was very dark, and two overhead bridges and a disused signal cabin, close to the track, were passed by the empty engine, but neither these circumstances nor the smoothness of the track, where there should have been the jarring of a cross-over, attracted the attention of the engineer or fireman. The cross-over was not properly provided with signals at both ends, though it was worked from an interlocking machine.

In still another case (at Glossop) an engineer ran straight along when he should have gone through a cross-over, but did not discover from the motion of the engine that he was going wrong.

At Nottingham, on the Midland, a passenger train stood ready to leave (9 p. m.) and the semaphore was lowered for it; it was detained two minutes or thereabouts and the signalman put the signal back to danger so as to let an empty engine switch across the main track. While this was going on the passenger train started and collided with the empty engine. The latter had no light on the (rear) end towards the train. There was a pilot with the passenger runner, but both men seem to have taken for granted that the signal would remain at clear after it was once put so.

At Wath, on the Midland, a passenger train ran past a distant and a home signal and crashed at 40 miles an hour into the rear of a freight. The runner's excuse was that he was instructing a green fireman how to fire. The freight train had broken in two and had been slow in backing off, moreover the conductor had been clumsy in recoupling. The station agent was nearby, but did not advise him to send a red flag, although the rear of the train was only barely within the protection of the signal. The signal man was not very cautious or alert, and so the inspector blames all these. The break-in-two resulted from the pulling out of a draw-bar in a private owner's car. The cotter which fastened the draw-bar was 1⅞ by ⅝ in., and was sheared off at both ends. Colonel Rich says this "is a very insecure mode of fixing."

At Bishopbriggs, on the North British Railway, July 22, a freight overran signals and was derailed by reason of oil on the track for 1,000 yards. This oil had leaked out of a cask in a car of a preceding train. Notwithstanding the long distance the train overran the signals, no one inquired or looked for the cause. All hands worked at getting the cars on the track, and in about an hour a passenger train came along and a second collision ensued. The station agent, who had 30 years' experience, "displayed great want of judgment" in not at once endeavoring to ascertain the cause of the first collision.

At Kinghorn, on the North British, a slight rear collision occurred by an engineer not obeying a distant signal promptly; but the signals were not arranged in the best manner, and the block system had not been adopted. The inspector says:

"In regard to the absence of block working, I have to call attention to the fact that in March, 1883, the North British Railway Company, under pressure from the Board of Trade, gave an undertaking, under the seal of the company, to complete the introduction of block working and interlocking upon the whole of their double lines within two years from August, 1883. It is apparent that upon that portion of the line lying between Burntisland and Kinghorn the above undertaking has not been fulfilled, and it will be for the company to explain why this is so."

A signalman caused a rear collision by giving a clear signal when the preceding train was only 300 ft. inside beyond the home signal and right in front of his cabin. His attention was distracted by an inspector.

The collision at Hexthorpe, Sept. 16, which was reported in these columns at the time (*Railroad Gazette*, Sept. 30), was the worst in the United Kingdom since that at Thorpe in 1874. Maj. Marindin makes an elaborate report, accompanied by a map. His recommendations can be summarized as follows: Both engineer and fireman failed to keep a proper lookout. The former assumed that, because other trains had stopped elsewhere for collection of tickets, his train would do so and therefore would not have to be stopped at Hexthorpe. Hence he was not preparing to stop. This assumption was in direct conflict with his printed instructions, and is not accepted as a good excuse. One of the flagmen was exactly opposite a semaphore signal. As flagmen are often stationed thus when signals are out of order, or the weather is foggy, the fireman probably got it into his head that this man was there for that purpose, and so although he saw him did not tell the runner. The flagman should have been stationed some distance away. Three-fourths of the weight of the train was braked, the non-automatic vacuum being used. The efficiency of the brake seems to have been not of the best. Although the traffic was exceptionally heavy and perhaps warranted the employment of flagmen between the block signal cabins, it would not have been by any means impossible to work it with tolerable promptness in the regular manner. Temporary fixed signals might have been provided. The practice of the officers in allowing the printed notice prescribing at what places trains should stop for collection of tickets to be varied from without general notice to all trains is criticised. Maj. Marindin concludes:

"I do not consider that the arrangements, which were made for working under the suspension of the block, were at all what they ought to have been. The risk of accident under such circumstances, notwithstanding the issue of carefully drawn-up instructions, is shown, not only by the catastrophe which actually occurred, but also by the fact that, while one of the men concerned [the fireman] did not read the instructions which he had received, the whole of the trainmen were, owing to the culpable carelessness of some official in omitting to issue to them the printed notices supplied by the Manchester, Sheffield and Lincolnshire, left without any notice of the suspension of block working, and only knew of it by their recollection of what had been done in former years and by seeing flag-signalmen out. The only conditions under which block-working could be safely suspended would be that every train should be stopped, not merely "brought up" or "checked" at the block signal cabin at the entrance to the portion of the line on which the suspension is in force, and the driver verbally informed of the state of affairs. This, I consider, should have been done at Hexthorpe junction, and if it had been done it may be taken as certain that the collision would not have occurred. * * The flag-signalman should also have been ordered to follow the usual rule, viz., to place two detonators on the line whenever it was necessary to exhibit a red flag."

It is to be noted that most, or all the engineers who ran past signals in the cases reported above were experienced and trusted men. Many of them had seen 20 years' service or more. One of 25 years' service was turned on a strange line by reason of an accident, and, instead of accepting a pilot, professed familiarity with the line. But he was not familiar, and ran past a signal and off the track with his whole train.

TECHNICAL.

Locomotive Building.

The Rhode Island Locomotive Works have just completed three passenger locomotives for the Louisville & Nashville.

The New York Locomotive Works of Rome, N. Y., has just shipped a passenger locomotive to the East Louisiana Railroad.

The Roanoke Machine Works, of Roanoke, Va., have filed a mortgage of $5,000,000 in favor of the Norfolk & Western, to secure advances made to the machine works.

Car Notes.

The Ontario Car & Foundry Co. is working on an order for 200 freight cars.

The St. Charles Car Works, of St. Charles, Mo., have just delivered to the Kansas City, Memphis & Birmingham a number of new ore dump cars.

The Columbia & Puget Sound road is building at its shops a number of new coal cars larger than those now in use.

The Litchfield Car & Machine Co. has recently constructed 20 new platform cars for the Southern Dispatch Lumber Line operated by the Evansville & Terre Haute.

The James Cresson Car Works, of Coburg, Ont., have just completed two new sleeping cars for the Intercolonial and will shortly complete three others.

The Fitchburg is building new car shops at Fitchburg in place of the present small and inconvenient shops at East Boston. The freight car shop will hold 96 cars, and the passenger car erecting and paint shops will hold 18 cars each.

Bridge Notes.

It is reported that the County Commissioners will erect an iron bridge at Hillsboro, Dak.

Proposals are asked, until July 5, for erecting and repairing several bridges by the County Commissioners at Marysville, Kan.

Proposals are wanted, until July 5, for the erection of ten bridges near San Diego, Cal. Address J. M. Dodge.

The County Commissioners will build an iron bridge across the Conemaugh River, at New Florence, Pa.

Three iron bridges will be built by the town of Darien, N. Y.

Proposals are wanted, until July 5, for the erection of an iron bridge near Junction City, Kan. Address P. V. Trovinger, County Clerk.

The Board of Freeholders will construct a bridge over the Paulin's Kill at Stillwater, N. J.

The Board of Freeholders of Paterson, N. J., has ordered plans and estimates for a new bridge to replace one which has been pronounced unsafe.

The Elizabeth Bridge Co., Elizabeth, N. J., will build an iron truss bridge over the Monongahela River. It is to have three spans and will be about 900 ft. long, with a roadway of 18 ft. clear.

The Board of Supervisors will receive proposals until July 10 for the construction of four bridges over the Salinas River in Monterey County, with approaches. Separate bids are to be made for each bridge. Address the County Clerk, Salinas City, Cal.

It is stated that the Delaware & Hudson will erect 20 new bridges on its line, substituting iron bridges with stone abutments for wooden bridges.

The county commissioners of Hancock County, O., ask for proposals for building a one span bridge over the Blanchard River. Proposals are also asked for building a three stone arch bridge.

The Randolph & Kansas City Bridge Co. has been incorporated to build a pontoon bridge across the Missouri River, near Randolph, Mo. The incorporators are L. A. Moore, M. A. Potts and others.

Plans for an iron bridge to cost $50,000, to be erected over Milwaukee River, in Milwaukee, Wis., will be furnished by the City Engineer.

J. A. L. Waddell and W. Dunbar Jenkins have formed a co-partnership as bridge designers, with office at 118 West 6th street, Kansas City, Mo. Mr. Waddell will have charge of superstructure, and Mr. Jenkins of substructure.

Manufacturing and Business.

The Waterhouse Electric & Manufacturing Co., of Hartford, Conn., has just shipped two carloads of arc lighting apparatus to the Centennial Exposition of the Ohio Valley, at Cincinnati, to fill a contract for lighting the exposition buildings and grounds.

John Tregoning, who has been for some time past superintendent of the Mather Electric Co., recently resigned to accept the appointment as superintendent of the Thomson Electric Welding Co.'s works at Lynn, Mass.

The Sprague Electric Railway & Motor Co. report large sales of standard motors. The company has closed contracts for the equipment of a road at Steubenville, O., and another at Salem, Mass.

The Virginia Car Equipment, Trust & Motive Power Co., of Portsmouth, Va., has been incorporated for the purpose of manufacturing cars, locomotives, etc. Thomas Breen, of Knowlton, Pa., is President of the company.

Chas. A. Schieren & Co. report recent sales of their Brooklyn rawhide lace leather to the following: Manhattan Railway Co., New York; J. B. Sheffield & Son, Saugerties, N. Y.; Atlanta Rubber Co., Atlanta, Ga.; the Bailey & Lebby Co., Charleston, S. C.; G. F. Drew Hardware Co., Jacksonville, Fla.; G. W. Lanning, Trenton, N. J.; Jersey City Paper Co., Jersey City, N. J.

The Pacific Lock & Seal Co., St. Louis, has been incorporated with a capital stock of $200,000 by L. A. Brown and others.

The Toledo Foundry & Machine Co., of Toledo, O., has lately shipped one of its Victor excavators to the Seattle, Lake Shore & Eastern.

The Boston & Albany has applied the Mason pump pressure regulator to the Westinghouse air-brake pump in order to maintain an even pressure in the train-pipe and reservoir, and it is reported to have given much satisfaction. Orders from several other roads have also been received by the manufacturers for this regulator.

The Lappin Brake Shoe Co. has been largely increasing the force at the works at Bloomfield, N. J., for several weeks, and is now running with nearly four times as many hands as two months ago. Among the recent orders for shoes received are the following: 16,000 for the Indianapolis Car Co.; 8,000 for the St. Charles Car Co.; 5,000 for the Atchinson, Topeka & Santa Fe; the usual 1,000 monthly order for the Manhattan elevated; the equipping complete of the cars and engines for the Kings County elevated.

The La Grande Interlocking Signal Co. is placing one of its signals at the crossing of the Atchison, Topeka & Santa

Fe and Chicago Belt roads at Chicago. Several improvements have lately been made in the apparatus.

The Palmerton Wrecking Frog Co. lately made a large shipment of frogs to a road in South Carolina. The company has also received several other large orders from southern roads.

The Cooke Locomotive & Machine Co., of Paterson, N. J., is about to put on the market a new high-speed automatic engine, under patents of Mr. James T. Halsey. The engine, it is stated, will be built in all sizes suited to electric systems.

Iron and Steel.

The Union Steel Co., of Chicago, is rolling an order for 75 lb. rails for the St. Paul, Minneapolis & Manitoba, which are to replace lighter rails on the main line.

The Whitaker Iron Co., Wheeling, W. Va., started up three of its sheet mills on Juue 4.

The Standard Foundry Manufacturing Co., of Cleveland, Ohio, has contracted for the rebuilding of its works, which were destroyed by fire some time ago.

The General Manager of the National Tube Works Co., of McKeesport, Pa., last week made a proposition that instead of a reduction in wages of from 7½ to 15 per cent., that a reduction of 7½ per cent. on all labor receiving $2 or less per day and 10 per cent. on all labor receiving an amount in excess thereof be made. This last proposition has been accepted by the workmen, and not, as stated last week, a reduction of 5 per cent.

The Cambria Iron Co., at Johnstown, Pa., has completed a large toughening machine for turning out steel locomotive axles of the larger sizes.

Wm. Swindell & Bros., Pittsburgh, Pa., have just finished one of their improved Siemens furnaces and one regenerative double puddling furnace for Morrison, Colwell & Page, Cohoes. They have also contracted to build one for the Chrome Steel Co., Brooklyn.

Thomas Lawther has been appointed superintendent of the mines of the Colorado Coal & Iron Co., at Crested Butte, Col.

The Georgia Pacific has recently closed a contract with the Bethlehem Steel Works, of Bethlehem, Pa., for a large amount of 60-lb. steel rails to be used in building the western extension, and over 6,000 tons has already been delivered in Mississippi.

The Navy Department, Washington, D. C., has received the following bids for steel for use in the construction of the United States armored cruiser Maine, to be built at New York. The three bids for steel plates were as follows: Linden Steel Co., of Pittsburgh, at $120,422; Carnegie, Phipps & Co., of Pittsburgh, $89,779; Chester Rolling Mills, of Chester, Pa., at $114,240. Carnegie, Phipps & Co. made the only bid for steel shapes, their price being $35,986. They also bid for steel rivets at $9,737. Oliver Bros., of Pittsburgh, bid $1,584 for this class. The Standard Steel Co., of Thurlow, Pa., bid for steel castings at 18½ cents per pound. The other bids for castings were: Midvale Steel Co., of Nicetown, Pa., at $56,448, and the Pittsburgh Steel Casting Co., at $50,176.

The Rail Market.

Steel Rails.—Sales of 29,000 tons are reported at a price equal to $30 at Eastern mills. It is said that a lot of 17,000 tons has been sold for delivery in the South. Quotations: $30 @$30.50 for standard sections at Eastern mills.

Old Rails.—Quotations: $20@20.50 for tees.

Track Fastenings.—Quotations: 1·85½ for angle-plates 2·10 for spikes.

Test of Wootten Engines on the Philadelphia & Reading.

An important test of locomotives, with Wootten and ordinary anthracite burning fire-boxes, was recently made on the main line of the Philadelphia & Reading by C. G. Steffee. The engines selected for the tests were 933 and 932. The former has what is known as a wagon-top boiler and narrow fire-box, and the latter a Wootten boiler and fire-box. Each engine hauled 145 loaded cars from Palo Alto to Port Richmond, and 165 light cars from Port Richmond to Palo Alto. The weight of coal hauled on the down trip was 1,380 tons by each engine It is stated that engine 933 used 26,600 lbs. of steamboat coal, costing $2 45 per ton, in making the round trip, and engine 932 consumed 32,500 lbs. of buckwheat coal, costing 60 cents a ton. The wagon-top consumed 11⅞ tons, at $2.45 per ton, equal to $29.09. The Wootten consumed not quite 14⅛ tons of buckwheat coal, which at 60 cents a ton would be about $8.60, or a difference in favor of the Wootten of $20.49, presuming that these quantities and prices are correct and represent fair average practice.

Another Electric Street Railroad.

On the 1st of the present month a street railroad, operated wholly by the electric current, was successfully opened in the Naugatuck Valley of Connecticut, running through the adjoining towns of Derby and Birmingham, thriving manufacturing villages of the Nutmeg state. The road is known as the Ansonia, Birmingham & Derby electric street railroad. Though the road has up to the present time done an exclusively passenger business, it was projected and built mainly for a freight road. The Naugatuck Valley Steamboat Company runs a line of steamers between New York city and Derby, the dock at the latter place, where the electric-power plant is located, being at the head of navigation in the Naugatuck River. Derby is on the east side of the river, and Ansonia constitutes its busiest section on the north. Shelton lies opposite Derby, and Birmingham to the north of the latter. These towns, lining both banks of the river, run into one another, making one continuous line of settlement. Derby and Birmingham are connected by a bridge across the river. The large factories of Ansonia are situated some three miles above navigation, and those of Birmingham at a less distance. The cost of freight by rail was a heavy item to the factories, while the competition by steamboat was neutralized by the excessive cost of cartage from the steamboat dock. The object, therefore, was to get the freight into Ansonia from the dock so cheaply that boats could become successful rivals of the two railroads running into the town, the Naugatuck and the New Haven & Derby. A charter was therefore obtained, and a road built on the Van Depoele electric street railway system. It is stated that the results have been very satisfactory.

The line of the road is located in an irregular form, somewhat in the shape of a letter V, the right arm of which is longest, and runs up through Ansonia; the left much shorter, extending across the river, over the bridge to Birmingham, and the stem down to Derby dock, where the power station is located. This is a large brick building, and is equipped with boilers and a 100 horse-power engine, whose service is to drive an 80 horse-power dynamo. The rails of the electric road are of the ordinary street railway kind, but are connected electrically by means of copper plates placed under the adjoining ends. This is for the purpose of using the rails for the return circuit. The wire through which the electric current is carried for service along the line is three-eighths of an inch in diameter, of copper, and is strung along about sixteen feet above the track. It is supported on wires strung across the street from posts on each side, each pair of posts being located about 100 ft. apart. From these cross wires suitable insulators depend, to which the current wire is attached. The current is taken from the wire by means of a flexible hinged arm, the upper end of which carries a grooved wheel, which is pushed or held up against the wire by means of a coiled spring in the angle of the arm, which keeps the wheel or "traveler," as it is called, up in its place and in full contact with the wire. The cars used (three in number) are of the ordinary horse-car pattern. One end of the car is partitioned off and contains the electric motor, which later is boxed up to protect it from the dust. The motor shaft is connected with the axle of the nearest pair of wheels, which become the drivers for the car, by suitable mechanism, the return circuit of the current being provided for by the connected rails. The cars are lighted by the current that propels them.—*Boston Herald.*

Aluminum.

Two new methods of producing this useful mineral are noted. In one, producing an alloy, two parts of finely powdered clay are mixed to the consistency of a paste with mineral oil; one part of sulphuric acid is then added, and the mixture thoroughly stirred. The mixture is then heated to a temperature of 1,500 deg. F. until the decomposition of the hydrocarbon is completed. After casting the product is powdered and mixed with an equal weight of any metal dust. This is heated to a white heat in a closed graphite crucible, in which a number of beads are formed, which are an alloy of aluminum. The inventor of this process, Mr. Faurie, states that the same method can be employed for separating silicon, calcium, magnesium, etc., from their oxides.

In the other process the pure metal is obtained through the displacement of aluminum from its ores by metallic sodium. The ore used is cryolite—the product of Greenland mines. This is ground to a fine powder with common salt for a flux, melted in a reverberatory furnace and when liquid runs into a ladle; while still liquid ingots of solid sodium are held at the bottom of the ladle until they are volatilized. The gaseous sodium rising through the melted cryolite combines with the fluorine in that mineral, freeing a part of the aluminum, which is found in a solid ingot in the bottom of the ladle. After the first charge salt is not used for flux, the slag, which contains some aluminum, taking its place.

Each pound of aluminum thus produced requires the consumption of about 3½ pounds of sodium. For the production of this pure caustic soda is melted in a pan and powdered coke is stirred into it. One hundred pound charges are ladled into a retort, where the carbon of the coke reduces part of the soda, and metallic sodium is distilled off and caught in a condenser, while carbonate of soda is left in the retort. *Engineering* thinks that by this process the sodium should not cost over one shilling sterling per pound.

The cost of the aluminum, which, unlike that obtained by the above described process and the various electric processes, is said to be pure, is given at 6s. per pound, and its present selling price is 48s. per pound. Aluminum bronze requires 5 to 10 per cent. of aluminum, and for iron and steel casting only one-tenth of one per cent. need be used.

Indicating the Capacity of Cars.

A system of numbering cars has been adopted upon several roads which has many advantages over any other, in that the number indicates not only the kind, but also length and capacity. The following classification will indicate the plan, it of course being possible to increase the number in each series to cover probable needs: Box, 1 to 500, 28 ft., 30,000 lbs.; 501 to 1,000, 30 ft., 30,000 lbs.; 1,001 to 1,500, 34 ft., 40,000 lbs.; 1,501 to 2,000, 34 ft., 50,000 lbs., etc. If a car 28 ft. long and of 30,000 lbs. capacity should be rebuilt or strengthened, producing a car of 40,000 lbs. capacity, it could immediately be re-numbered in the series assigned to this particular class of car, and its identity still preserved through the historical records kept in the office of all master car-builders.—*Equipment Guide.*

A Steel Passenger Car.

The Steel Car Company, of which Gen. Adna Anderson is reported to be President and H. D. Perky Vice-President, is said to be building, at East Boston, Mass., a steel car. It will be finished in a short time and will be upholstered with fire-proof upholstery. It contains an observation room, locker, ladies' toilet private room, large parlor, buffet, smoking room, gentlemen's toilet. The halls and end rooms will be upholstered in leather, and parlor and private room in silk plush.

A Novel Sleeping Car.

There is on exhibition at 21 School street, Boston, a model of a sleeping car, devised by L. J. Harris, which is designed to obviate all the objections to Pullman, Wagner, Mann or Monarch cars, and secure the advantages of the best of these. The plan and arrangement are described as follows:

The cars are to be 64 ft. long, mounted upon six-wheel trucks. At one end they will have a kitchen, pantry, toilet room, linen closet and heater. At the other end there will be an observation room, a large stateroom, a toilet room, a library closet and an iron safe with separate drawers for each passenger to deposit valuables. The centre of the car will be occupied by the main saloon, which in the daytime will be simply a handsome drawing room, with high-studded roof, wide and high windows, and comfortable reclining or revolving chairs. There is no appearance of any berths, and apparently not the slightest place for them. But as night approaches the porter raises a series of trap doors in the floor of the car on either side of the centre aisle, and, fastening the doors in a position at right angles with the side of the car, forms 10 sections, each entirely independent of the others. By means of a crank, two berths in each section are raised from beneath the floor into their proper position, where they are securely fastened, and the chairs are put beneath them in the pockets where the berths rested during the day. The berths are found all made up, the mattresses, sheets, blankets and pillows being in their appropriate places, and each section is all ready for occupancy within two minutes from the time the trap door is raised.

A glance at the outside of the car shows that its body drops down some 12 in. between the trucks, thus giving room for berth pockets. These pockets do not extend entirely across the car, but under the centre of it is room for the brake rods and air pipes, while steam pipes are run along the sides of the pockets, having registers opening into the centre of the car, through which the heat is diffused. There is a system of trusses which give sufficient strength to the depressed floor. Connection is made between the chamber containing the steam pipes and the berth pockets, the beds thereby being kept dry and warm. The berths are to be two inches longer and four inches wider than those in other cars, while there will be eight inches more space between the lower and upper ones.

New Method of Making Copper Tubes.

A new method of making tubes from copper has been lately brought to notice in England. It has, of course, long been known that copper could be deposited from a solution by the electric current in a circular form as well as in any other, but the product could not be made use of, owing to its crystalline and incoherent character. The great desideratum was to obtain the deposit in a fibrous instead of a crystalline form. That has now been done in the following manner, which, though it may be improved upon, is of a practical character.

A long mandrel the size of the interior of the finished tube is inserted in the bath from which the copper is to be deposited, and is kept slowly revolving to insure the uniform thickness of the deposit. Along the surface of this mandrel a small agate burnishing tool is made to travel (like a turning tool in an engine lathe) with a pressure sufficient to break down the crystals of copper as they are deposited, and leave a hard, smooth surface for a new layer. The speed of the mandrel and tool are so adjusted that a deposit of about $\frac{1}{1000}$ of an inch in thickness occurs between each two excursions of the tool.

When the deposit has attained the required thickness the mandrel is removed from the bath and placed in a closed chamber, to which superheated steam is admitted. This quickly expands the copper envelope, so that it becomes loose on the mandrel, and can be easily slipped off, the mandrel being then returned to the bath for another deposit.

Tubes made in this manner are said to have a dense close structure, and to show much greater strength than those made in the ordinary way. The cost, too, is estimated to be less than is now paid. Should this process prove as satisfactory as the experiments thus far made would seem to indicate, we may shortly expect to see tubes of this kind in the market.

THE SCRAP HEAP.

That Pittsburgh Girl.

"Are you familiar with Thackeray's works, Miss Sooter?" asked Mr. Miles Standish of the Pittsburgh girl, and she artlessly responded, "Can't say that I am. I do not keep the run of half the foundries they are are putting up in Pittsburgh."—*Boston Commercial Bulletin.*

They Manage These Things Better in France.

The principal French railroads have announced that at all the buffets on their system, from 10:00 a. m. to 12:30 p. m., and 5:00 p. m. to 7:30 p. m., dinner (repas à table d'hôte et à la carte) will be served at 30 cents per head. The meal will consist of soup, plate of meat and vegetables, cheese, a carafon of wine, and bread à discrétion.

Mr. Chauncey Depew would considerably improve his chances for the Presidency if he could induce a French refreshment contractor to introduce here the clean table cloth and napkins and the appetizing viands always found at a French railroad buffet.

The Sault Ste. Marie Water Power.

A Detroit dispatch of June 8 says that a satisfactory agreement was reached Wednesday night between the Power Company and the citizens of Sault Ste. Marie. The citizens subscribe $100,000, of which $50,000 is to be cash in the bank July 15, and $50,000 on demand Oct. 11. In return they get 2,000 shares of stock at 50 cents on the dollar. The company is to put up in Sault banks $100,000, one-half cash and the other good securities, maturing Oct. 15, all of which is to be expended in building the proposed water-power canal through the heart of the city. Work is to begin in 30 days after the first deposit. The canal is to be constructed as soon as possible, and the city must build and maintain all needed bridges. All parties wanting power are to have access thereto at reasonable rates up to certain limitations, and free mill sites are to be given manufacturers.

Midvale Steel Co.

In the suit of Samuel Huston vs. E. W. Clarke, Wm. Sellers and John Sellers, Judge Biddle in the Court of Common Pleas (Pennsylvania) lately gave a decision against the plaintiff. The parties named were jointly interested in the property some years ago. On a sheriff's sale of the property under a mortgage in 1880 it was bought in by Wm. Sellers for $450,000. Mr. Huston claimed an interest as well as the defendants. The parties to the suit, under an agreement made in 1873, made up a "guarantee fund" to pay the debts of the Midvale Steel Works. This fund, the defendants asserted, had become exhausted in paying the debts, and all of the parties, including the plaintiff, thus sunk their money in the effort to extricate the works from debt. Mr. Huston, however, asserted that this fund was not exhausted and he was, therefore, entitled to his pro rata share in the new concern.

Judge Biddle decides that Mr. Huston contributed nothing to the purchase money at the sheriff's sale in 1880. "We utterly fail to see," says the Judge, "what possible interest Mr. Huston has in the new company, or why he is entitled to the same proportion of capital stock of the new company that he had in the old." The plaintiff's bill was therefore dismissed.

Waiters who Wait Too Long.

One of the most striking illustrations of the evils of tipping porters and waiters is to be noticed in buffet and dining cars. Without fees it is almost impossible to get reasonable service if there is more than half a car load of passengers or the slightest pretext for delay.—*Railway Review.*

Passengers in lots of 5 tons, or over, should therefore be be given a reduced rate, say 95c. per head O. R. C.

Attempted Train Robbery.

An attempt early June 6 to wreck a north-bound express train on the Kansas City, Fort Scott & Gulf was made about five miles east of Springfield, Mo. The switch rail was unbolted and a stone crowded in to throw the rail out of place. The switch target was left in position for the main line. The engineer of the passenger train saw the danger just in time to reverse the engine and apply the brakes. He succeeded in keeping the coaches on the track, but the locomotive was derailed. The train had about $200,000 on board.

A Salt Lake Car.

Salt Lake City is about to send a car east as far as Cleveland, Ohio, to boom the resources of Utah, and the local papers say that "this car is simply the most gorgeously designed and elegantly executed affair of the kind ever put upon a railroad in America." It is added that "Major Kent has donated the services of his band of 17 pieces to escort the car from the Museum to the Utah Central depot as it goes on its wonderful mission to interest the East in this beautiful city and Territory."

The exterior of the car is covered with "oil paintings" by Culmer and Lambourn, and "still life paintings from the brush of Dan Weggeland," while the interior is fitted up with silver mounted cases for the display of Utah products, and decorated with photographs and paintings. The products include minerals, grains, fruits, fabrics, and it is said that "an elder in Judah brought a child into the Chamber of Commerce yesterday, requesting that it be taken along in the exposition car as a sample of Utah's most productive crop." We have not space to describe the pictures which cover the exterior. The Salt Lake *Tribune* has recently treated them at length. Of the "Pillars of the Wahsatch," by Culmer, it is said that "the Pillars, towering to heaven in great naked masses of rock, naked save for the folds of pure white snow, present a sublime sight as seen from the vales beneath. Mr. Culmer's view is taken near Lake Blanche, where a stream from the sun above leaps over a high bluff into a deep ravine,

in which grow the tall dark pine," etc. "Castle Gate," by Lambourne, is thus described: "A moonlight view of perhaps the most celebrated scene on the Little Giant. Price River plunging over rocks to rush between the huge walls of the gate. On the left hand the north portal, its vast height misty in the moonlight; on the right, the south portal dark against the white orb, and at their feet the engine working its way up the steep grade, spitting fire." Amongst the still life, "a large-size picture of a cabbage attracted universal attention, owing to its wonderful likeness to nature. This feature of decoration added much to the general effect."

It is said that "a number of Eastern gentlemen in this city visited the car and expressed it as their opinion that the car would create a sensation wherever it went," which one may well believe. We are told that the car "will be in the hands of Harry Culmer and Judge E. F. Colborn. These gentlemen are eminently fitted for the work, are brilliant, good talkers, candid and sincere, and heartily believe in a grand future for Utah and Salt Lake City. They will convey this briefly to those whom they meet, and the harvest will surely be bountiful, although in many instances it may be delayed for a time." We wish them all success in their journey of enlightenment.

Train Robbers.

A bold attempt was made to rob the baggage and express cars of the Cincinnati, Indianapolis, St. Louis & Chicago, at Delhi, O., a point 11 miles west of Cincinnati, on the night of June 8. Baggage Master Ketchum and H. J. Zimmerman, of the American Express Co., were alone in the car. Near Delhi some tramps were seen through the window of the car door leading to the front platform next to the locomotive tender. Both men arose and went toward the front door, but were fired upon and Ketchum was killed. Zimmerman tried to draw his pistol, but it stuck in his hip pocket, and he retreated to the rear platform of the car, where he met the conductor The latter pulled the bell rope and stopped the train. While this was going on one of the tramps climbed on the tender, where he was met by the engineer and fireman and knocked stiff by two blows from a monkey wrench. The engineer and fireman then rolled him off the tender while the train was at full speed. Before he was thrown overboard, however, a second robber attempted to climb on the tender, but he dodged back at the sight of the prostrate form of his companion. Before the train stopped more than one robber was seen to jump off and disappear in the darkness. All of them wore masks. Not a word was spoken by the robbers during the entire affray, and not a shot was fired at them. Zimmerman says he saw four men distinctly. The police, mounted and on foot, aided by a large force of citizens, patrolled the river front all night and scoured the country to intercept the men. The sheriff is out with a large posse. The Kentucky authorities have also been notified to be on the lookout.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Lowell, quarterly, 3 5 10, payable July 2 to stockholders of record June 9.

Boston & Providence, quarterly, 2½ per cent, payable July 2 to stockholders of record June 9.

Central of Georgia, semi-annual, 4 per cent., payable June 22 to stockholders of record, June 6.

Chicago & Northwestern, quarterly, 1¾ per cent., on preferred stock; also, semi-annual, 3 per cent., on common stock, payable June 27.

Cincinnati, Indianapolis, St. Louis & Chicago, quarterly, 1¼ per cent., payable June 15 to stockholders of record June 1.

Manhattan, quarterly, 1 per cent., payable July 2.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Cincinnati, Hamilton & Dayton, annual meeting, Cincinnati, O., June 19.

Oregon Improvement Co., annual meeting, Portland, Or., June 18.

Oregon Railway & Navigation Co., annual meeting, Portland, Or., June 18.

Oregon & Transcontinental, annual meeting, Portland, Or., June 18.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Railway Master Mechanics' Association*, next annual convention, Thousand Islands, N. Y., June 19.

The American Society of Civil Engineers will hold its annual convention in Milwaukee, Wis., the last week of June.

The *Ohio Institute of Mining Engineers* will hold its summer meeting at Logan, O., commencing July 11.

The *International Association of Car Accountants* will hold its annual meeting in Montreal, Can., June 20.

The Railroad Accounting Officers will meet at the Hotel Brunswick, New York City, July 25, to organize a permanent association.

The Association of Railway Telegraph Superintendents will hold its seventh annual meeting at the Murray Hill Hotel in New York city July 11.

The *National Association of General Passenger and Ticket Agents* will hold its fall meeting in Saratoga, N. Y., Sept. 18.

The *National Association of General Baggage Agents* will hold its next meeting in New York City July 18.

The *New England Railroad Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, on the third Thursday of each month.

The *Western Railway Club* meets in Chicago the third Wednesday in each month.

The *Central Railway Club* meets at the Tifft House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *American Society of Civil Engineers* holds meetings on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street, N. Y.

The *Boston Society of Civil Engineers* holds its regular monthly meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday of each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

The *Engineers' Society of Western Pennsylvania* meets in Pittsburgh the third Tuesday of each month.

Engineers' Club of Philadelphia.

A regular meeting was held June 2.

Mr. A. Marichal read a paper on the "Public Health of Cities and Towns," of which the following is an abstract:

In many cities the water-works are supplied neither with filters nor subsiding reservoir, and, after a heavy rain, the water contains clay powder which is decidedly injurious, especially to children, causing inflammation of the bowels and other troubles, the cause of which is generally unknown, although thousands of people are affected. If every property owner would consider a filter a no less essential part of a dwelling than a bath-tub or a water-closet, a supply of pure water would be enjoyed by the poor as well as by the rich, and without appreciable cost to any one.

The system of sewers should be such as not to allow any filthy matter to remain in it more than twelve hours. To obtain these results the sewers should have sufficient slopes and should be flushed every day. Manholes should be made air tight. Ventilation pipes should be placed at the *upper part* of the sewer, should be extended under the pavement to the house line and thence carried above the roof of the buildings. These pipes need not be of large diameter, but should be numerous. Cesspools should be strictly prohibited.

Street cleaning should be done between midnight and 5 a. m., as it is unsafe to inhale all the dust accompanying this operation.

There are, perhaps, few causes contributing more to the increase of the death rate than the deliberate overcrowding of the street cars. Municipal authorities should limit the number of passengers to be admitted on a car.

The Secretary presented, for Mr. W. S. Sheafer, "Notes on the Coal Deposits of Sonora, Mexico." Part of the coal is easily accessible by rail and of commercial importance. The character of the coal is a good grade anthracite, showing, by analysis:

Fixed carbon	80.17
Moisture	8.45
Volatile matter	6.05
Ash	5.33

The Secretary presented, for Mr. A. W. Sheafer, a note upon "Electric Haulage in Anthracite Mines." He refers to the progress so far made, etc., and gives the following comparison of cost with older methods:

COST PER TON-MILE.

Mules.	Steam.	Electricity.
$1\frac{83}{100}$ cents.	$\frac{6}{10}$ cent.	$\frac{4}{10}$ to $\frac{67}{100}$ cent.

The Secretary also presented, for Mr. A. W. Sheafer, a photograph and description of the stripping of the mammoth coal bed at the Shenandoah City Colliery, Schuylkill County, Pa.

The Secretary presented, for Mr. G. W. Jones, a blue print and description of a valve motion, which is claimed to be new, of the class in which the cut-off and the reversal of the engine are secured by the use of adjustable eccentrics.

The Secretary presented, for Mr. Howard Constable, a description of the Montague St. Electric Railway and Elevated Terminal Station at Wall St. Ferry, New York, illustrated by numerous drawings showing the difficulties of the situation, different forms of electric cars, etc.

There was some discussion by Messrs. T. Carpenter Smith and Henry G. Morris.

Prof. L. M. Haupt presented an outline of a study entitled "The Great Transportation Areas of the United States," in which he determined the locus of the points from which the cost of transportation to tide-water would be the same whether carried by rail entirely or partially by river and rail, or by lake, canal and railroad. It resulted in a division of the country into five grand areas, of which the natural outlets were the Atlantic, Gulf and Pacific coasts, the Mississippi River and the great lakes. The ocean rate being but about one sixth that by rail, it was shown how important it was to reach tide-water by the line of least resistance. The Northern and Southern, or Lake and Gulf routes, were briefly contrasted, and the importance of creating a deep water outlet for the grand railroad empire of the Southwest was pointed out as being one of the most important of the transportation questions of the present and the future. The extent of territory tributary to the gulf, as the nearest point for Eastern traffic, was estimated at about *one million* square miles. Attention was called to the proposed Deep Water Convention, to be held at Fort Worth, July 10, and it was stated that the present available depth is but 12¾ ft., which is found on the bar at Galveston.

Prof. Haupt also presented drawings showing a method of building tunnels under rivers.

Western Society of Engineers.

Regular meeting of June 6. Mr. Lewis B. Jackson was elected a member. A Committee on Employment was ordered to consider a plan for helping members of the society in securing professional positions. Letters were read and remarks made on the death of Mr. William L. Baker, of the Detroit Bridge & Iron Works, and also on Mr. Charles Latimer. A committee was appointed to report suitable resolutions on the lives of both.

A paper by A. M. Van Auken was read on the Classification of Material in Railroad Construction, and a supplementary paper on the Commissary in Railway Field Parties. Considerable discussion was had and the papers will be further discussed at the next meeting, July 11.

PERSONAL.

—Mr. Robert E. Libby, for many years with the American Brake Co., has joined the Congdon Brake Shoe Co.

—Frank Trumbull, Auditor of the Texas & Pacific, has tendered his resignation, and will devote his attention to mercantile affairs.

—John C. Pratt, for a number of years President of the Ogdensburg & Lake Champlain Railroad, died in Boston, June 7, at the age of 70.

—Amos Pilsbury, General Master Mechanic Maine Central, is critically ill. It is now thought that he will recover, but he is not out of danger.

—Ezra H. Baker, a director of the Union Pacific, and President of the American Loan & Trust Co., died in Boston, June 7, of blood poisoning.

—Mr. C. T. Schoen, Vice-President of the Charles Scott Spring Co., has severed his connection with that company, after having been connected with it since it first started.

—G. W. Cushing has resigned his position as Superintendent of Motive Power and Rolling Equipment of the Philadelphia & Reading. It is said that the resignation is to take effect July 1.

—Thomas L. Greene, the well-known writer on railroad and economic questions, is secretary of the committee of Missouri, Kansas & Texas directors which is to examine into the recent administration of the road by the Missouri Pacific as lessee.

—Horace J. Hayden, Second Vice-President of the New York Central & Hudson River, will act as chairman of the Trunk Line Association during the absence of Mr. Fink in Europe. Mr. Fink sails on the 20th, and will be at Carlsbad for a month.

—George W. Parker, who succeeds W. Bayard Cutting as President of the St. Louis, Alton & Terre Haute, has been connected with the company for 25 years, first entering its service as a local attorney. In 1865 he became General Counsel and a director in the road. In 1867 he was made Vice-President, and in 1869 he was also chosen General Manager, which office he still holds.

ELECTIONS AND APPOINTMENTS.

Boston & New York Air Line.—At the annual meeting held at Middletown, Conn., last week, the following directors were chosen: H. B. Hammond, S. S. Sands, T. L. Watson, New York; S. F. Loomer, Willimantic; Simeon E. Baldwin, E. H. Trowbridge, George H. Watrous, New Haven: Theodore Adams, Philadelphia; William D. Bishop, Bridgeport; J. W. Camp, Benjamin Douglas, Middletown.

Boston & Quebec Air Line.—The incorporators are as follows: Frank Jones, of Portsmouth, N. H.; Charles A. Sinclair, George W. Armstrong and J. P. Cook, of Boston; George Van Dyke and Irving W. Drew, of Lancaster, N. H.; Enoch G. Sweatt, of Woonsocket, R. I.; Henry Pope, William Sawyer, Francis P. Buck and James R. Woodward, of Sherbrooke; William B. Ives, M. P.; George Turcot, M. P.; A. T. Johnson, M. P. P.; J. E. Gironard, M. P. P.; Joseph Tavergue, M. P.; Jacques Picard, M. P. P.; C. I. Rinfret, M. P.; P. M. Guay, M. P., and F. X. Lemieux, M. P. P.

Carthage & Adirondack.—Samuel Q. Brown has been elected President vice B. D. Benson, deceased. R. D. Benson has been elected Treasurer, with office in New York, to succeed Mr. Brown.

Central (New Brunswick).—The following officers were elected at the annual meeting last week: President, C. Ford Stevens; Vice-President, F. E. Barker; Secretary and Treasurer, W. T. Whitehead; Solicitor, Hon. A. G. Blair; Chief Engineer, T. M. Williamson.

Chicago & Eastern Illinois.—The annual meeting was held in Chicago, June 6, and the old board of directors was re-elected and the following officers: President, H. H. Porter; Vice-Presidents, O. S. Lyford and George C. Kimball; Treasurer, C. W. Hiliard; Auditor, H. A. Rubidge; Executive Committee, H. H. Porter, R. P. Flower, H. R. Bishop, Benjamin Brewster and Henry Siebert.

Chicago & Grand Trunk.—James McQueen, Jr., has been appointed Assistant General Freight Agent, to succeed J. Main, deceased.

Chicago & Indiana Coal.—The annual meeting was held in Chicago, June 6, and the old board of directors was re-elected with the following officers: H. H. Porter, President; George C. Kimball and O. S. Lyford, Vice-Presidents; C. W. Hillard, Secretary and Treasurer; J. H. Kingwell, Assistant Secretary; H. H. Porter, R. P. Flower, H. R. Bishop, Benjamin Brewster, and Henry Seibert, Executive Committee.

Chicago & Northwestern.—At the annual meeting held in Chicago, June 7, A. G. Dulman, David P. Kimball, Chauncey M. Depew, Samuel F. Barger, Albert Keep, and M. L. Sykes were re-elected directors for a term of three years, and the following officers were unanimously elected: Albert Keep, Chairman of the Board of Directors; Marvin Hughitt, President; M. L. Sykes, Vice-President, Treasurer, and Secretary; J. B. Redfield, Assistant Secretary and Assistant Treasurer; S. O. Howe, Assistant Secretary and Assistant Treasurer in New York; Executive Committee, Albert Keep, M. Hughitt, W. L. Scott, A. G. Dulman, C. M. Depew, H. McK. Twombley, Samuel F. Barger, David P. Kimball. There were 423,035 shares voted on.

Chicago, St. Louis & Paducah.—The first annual meeting was held in Duquoin, Ill., June 5, and the following officers and directors were elected: President, William K. Murphy; Secretary, H. T. Nash; Directors, Charles Reed, of Paducah, Ky., and James Roberts, of Illinois.

Cincinnati, Jackson & Mackinaw.—W. T. Backus has been appointed superintendent of the Ohio Division, with office at Van Wert, O., vice L. W. Buckmaster.

Cincinnati, Washington & Baltimore.—Horace Johnson has been appointed Superintendent of Telegraph, with headquarters at Chillicothe, O., vice Chas. A. Beery, resigned.

Colorado Midland.—G. A. Cartwright has been appointed General Freight Agent, with headquarters at Denver, Col.

Denver & Rio Grande.—The following officers were elected at a meeting of the Board of Directors in New York, June 7: Chairman, George Coppell; President, D. H. Moffet; Vice-President, R. B. Minturn; Secretary, William Wagner, and Treasurer, George W. Gilluly.

Des Moines & Fort Dodge.—At the annual meeting held in Des Moines, Ia., June 7, the following were elected directors: W. G. Purdy, A. S. Hollister, C. N. Gilmore and Thomas S. Wright.

Duluth, Rainy Lake & Southwestern.—The annual meeting was held in La Crosse, Wis., June 5, and officers were elected as follows: Nathan Myrick, President; G. J. Johnson, Vice-President; M. T. Moore, Secretary; Lafayette Holmes, Treasurer. The former board of directors was also re-elected.

Emporia & Council Grove.—The following directors have been elected for this new Kansas company: Daniel Bitler, of Alpe, Lyon County; David Taylor, T. J. Wibley and Thomas L. Ryan, of Emporia, Kan.; William H. Anderson and J. S. Gibson, of Americus, Lyon County; A. W. Hinchman, of Dunlap, Morris County, and J. M. Henson, A. Moser, Jr., W. F. Shamleffer and W. H. White, of Council Grove. The principal office is to be in Council Grove.

Gainsville, Jefferson & Southern.—The annual meeting was held in Jefferson, Ga., June 9. A. D. Chandler was elected President and H. W. Bell, F. L. Pendergrass and W. C. Howard, of Jefferson, were elected directors.

Greenwood Lake & Port Jervis.—The directors of this new company are as follows: J. Hugh Peters, Ezra C. Dillingham, George L. Hutchings, all of Englewood, N. J.; Chester Huntington, Flushing, L. I.; William O. McDowell, Samuel H. Smith, Joseph F. Sweasy, all of Newark, N. J.; William L. Meriam, Russell F. Low, of New York; Theodore H. Smith, Orange, N. J.; Charles S. Noyes, Montclair, N. J.; William S. Blake, Brooklyn; Henry R. Low, Middletown, N. Y.

International & Great Northern.—J. E. Galbrieth has been appointed General Passenger Agent in addition to his duties as General Freight Agent, W. B. McCullough having resigned as Passenger Agent.

The office of Superintendent of Transportation has been created and F. G. Golden has been appointed to the office.

Lenora, Oberlin & Northwestern.—The directors of this new Kansas company are as follows: J. B. Hitchcock, A. H. McGee, George A. Metcalf, Charles E. Chandler, G. Webb Bertram, J. B. O'Toole, N. Lerpold, W. A. Loveland and W. A. Frazier, of Oberlin; S. Larrich, of Lenora, Norton County; F. D. Mills, George D. Storch, A. S. Everest

E. H. Blair and W. H. Hetherington, of Atchison, Kan. The principal office is to be in Oberlin.

Macon & Dublin.—D. M. Hughes, Allentown, Ga., is President of this road, and H. S Morse, Macon, Ga., is Vice-President and General Manager.

Mexican Pacific Coast.—The following are the directors of this company: Eaton N. Frisbee, Robert G. Ingersoll, Frederick F. Woodward, Benjamin S. Harmoa, Charles Blizard, William Windom, Isaac H. Brower, Charles H. Stitt, of New York; Edward W. Hobbs, of Brooklyn; Joseph S. Negley, of Pittsburgh, and N. Noble Betts, of Towanda.

Milwaukee & Northern.—The following directors were elected at the annual meeting in Milwaukee, Wis., June 5: Alfred M. Hoyt and Samuel N. Hoyt, of New York; Angus Smith, Guido Pfister, E. Mariner, J. C. Spencer and Charles Ray, of Milwaukee. The directors elected the following officers: President, A. M. Hoyt; Vice-President, J. C. Spencer; General Manager, C. F. Dutton; Secretary and Treasurer, Charles Ray; Assistant Secretary, E. Mariner; Assistant Treasurer, John C. Spencer; Executive Committee, Angus Smith, Guido Pfister and Charles Ray.

Nebraska & Southwestern.—The directors of this new Kansas company are: William Donley, George H. Bailey, William M. Hendrick, Warren A. Hendrick and Asa H. Bradstreet.

New York, Mahoning & Western.—Dr. Norvin Green, President of the Western Union Telegraph Co., has accepted the Presidency of this road, now building.

Ohio River.—J. N. Camden, Jr., has been elected Treasurer, and J. A. Fickinger has been elected Chief Engineer, with office in Parkersburg, W. Va.

Ohio Valley.—The annual meeting was held in Henderson, Ky., June 6, at which the following were elected directors: C. C. Baldwin, W. H. Tillinghast, Herman Clark, New York; S. S. Brown, Pittsburgh; P. G. Kelsey, Henderson; Arthur Carey, Jordan Giles, Louisville. Dr. P. G. Kelsey was elected president; S. S. Brown, Vice-President; Jordan Giles, Secretary and Treasurer.

Olympia, Black River & Chehalis.—The incorporators of this company are S. G. Simpson, James K. Murphy and George Simpson, all of Seattle. The principal office is at Seattle.

Oregon Railway Extension Co.—The incorporators of this company are as follows: H. W. Corbett, C. H. Lewis, Henry Failing and W. H. Holcomb.

Paris, Choctaw & Little Rock.—The following officers have been elected: S. J. Wright, President; D. H. Scott, Vice-President; L. P. Harrison, Treasurer; B. J. Baldwin, Jr., Secretary. The general office is at Paris, Tex.

Paris, Choctaw & Little Rock.—C. G. Woodbridge, Houston, Texas, has been appointed Chief Engineer.

Peoria & Pekin Union.—James W. Hill has been appointed Master Mechanic, with office in Peoria, Ill., in place of R. F. Hurd, resigned.

Poughkeepsie Bridge Railroad Co.—The directors of this new company are: Arthur Brock, Arthur E. Newbold, Charles B. Hart, William B. Scott, Henry C. Gibson, Morton C. Michael, A. M. Moory, William Q. Carter, W. W. Gibbs, Henry McConnell, Randal Morgan, G. A. Cleveland, C. Fowler, Jr.

Russell & Southeastern.—The directors of this new Kansas company are: Theodore Ackerman, Charles A. Walcott, N. Walcott, Charles P. Copeland, all of Russell; and S. E. Hall, E. W. Ober, C. Culph, Oscar Seitz and O. L. Atherton, all of Salina.

St. Louis, Arkansas & Texas.—The office of L. F. Day, Assistant General Freight Agent, has been transferred from Texarkana to Fort Worth, Tex.

San Diego, Cuyamaca & Eastern.—Col. Frederick Mack is Chief Engineer of this road, and G. D. Waterman is Secretary. The general office is in San Diego, Cal.

Statesville Air Line.—At a meeting last week the following directors were elected: J. J. Mott, S. A. Sharpe, W. A. Eliason, David Wallace, P. C. Carlton, T. N. Cooper, R. R. Gwyn, Wilfred Turner and C. L. Summers.

Texas & Pacific.—J. W. Stacey has been appointed Superintendent of Telegraph, with office in Marshall, Tex., in place of W. D. Littlefield.

Union Pacific.—J. J. Burns has been appointed Assistant General Purchasing Agent, with headquarters at Omaha. The office of Supply Agent has been abolished, taking effect June 1.

Vermont & Massachusetts.—The annual meeting was held at Boston May 7, and the following board of directors was elected: D. S. Richardson, Francis Goodhue, G. F. Fay, T. K. Ware, E. L. Davis, Alvah Crocker and C. A. Welch, the only change from that of last year being in the election of Mr. C. A. Welch to fill the place on the board made vacant by the death of Mr. W. H. Hill.

OLD AND NEW ROADS.

New Companies Organized.—Mexican Pacific Coast.—Nebraska & Southwestern.—Olympia, Black River & Chehalis.—Oregon Railway Extension Co.—Poughkeepsie Bridge Railroad Company.—Russell & Southeastern.

Billings, Clark's Fork & Cooke City.—From the prospectus issued by this company we abstract the following: The road is to be built from Billings, Montana, on the Northern Pacific, southwesterly up the valley of Clark's Fork River to Cooke City, a distance of 115 miles, with a branch leaving the main line at a point 25 miles from Billings and extending up a tributary of Clark's Fork a distance of 31½ miles, a total distance of 147 miles. The chief engineer is now securing the right of way through the Crow Indian Reservation.

In addition to $2,500,000 of capital stock there is a bonded indebtedness of $2,000,000 of first mortgage 6 per cent. gold bonds. During the present year it is proposed to build from Billings to mouth of Clark's Fork cañon, a distance of 88 miles, also a six mile coal branch. It is thought the coal mines will be reached by Oct. 1, and the cañon by December.

The company will probably close a contract this month for supplying the Northern Pacific with 50,000 tons of coal per year. It is also estimated that the local consumption would amount to as much more. The cost of construction is placed at $1,149,723, or $13,300 per mile, and is itemized as follows: Grading, etc., $775,268; bridge over Yellowstone River, $24,465; coal plant at mines, equipment, terminals, right of way, etc., $275,000; one year's interest on bonds (6 per cent. $1,250,000), $75,000. The consent of the Indians to pass through the Reservation is being obtained, and when this has been obtained, contracts for constructing the road will be let. P. M. Gallagher, Billings, Mont., is Chief Engineer.

Boston & Albany.—The contract for building the new passenger station at Springfield, Mass, has been let to Norcros Brothers, of Worcester, at something less than $400,000. Two separate buildings, one on each side of the track, are to be erected.

Boston & Quebec Air Line.—A bill will be introduced in the Quebec Legislature to incorporate this company to construct a double or single track road from a point on the Grand Trunk or Quebec Central near the town of Levis, opposite Quebec City, southerly to Cookshire, in the county of Compton, where connection will be made with the International. The company also asks that power be granted it to lease to or consolidate with other roads. The capital stock will be $1,000,000.

Brooklyn & Montauk.—At a special meeting in New York this week the stockholders authorized the issue of $600,000 bonds, of which $510,000 will be used to replace net earnings expended in betterments, $40,000 to pay off mortgages on real estate, and $50,000 to be held in the treasury for future needs. The dividends of 30 per cent. on the preferred and 20 per cent. on the common stock recently declared by the directors were approved.

Burlington & Missouri River.—The Northern Division is now completed and in operation to Erickson, Wheeler County, Neb., 17 miles north of Greeley Centre.

Central New Brunswick.—About 10 miles of track has been completed from Norton toward Fredericton, New Brunswick, and as far as Grand Lake the grading and bridging has all been completed ready for tracklaying. The St. Martins & Upham, extending from Hampton on the Intercolonial to St. Martins on the Bay of Fundy, which has recently passed under control of this company, is to be re-laid with steel rails.

Chicago & Indiana Coal.—Tracklaying has been commenced on the extension being built from Goodland, Ind., 20 miles, to a connection with the branch being built by the Chicago & Eastern Illinois.

Chicago, Kansas & Nebraska.—Much of the heavy work between Colorado Springs and Granger, Col., is reported completed. Grading has also been completed to a point about 15 miles east of Granger.

Chicago & Northwestern.—Tracklaying has been completed to a connection with the Duluth, South Shore & Atlantic at Michigamme, Mich., on the extension being built to that place from Ishpeming.

Chicago, St. Louis & Paducah.—About 15 miles of the road is now completed and placed in operation, and it is thought that the entire line from Parker City to Brooklyn, Ill., on the Ohio River and opposite Paducah, Ky., a distance of 54 miles, will be in operation by Nov. 1. The road is leased to the St. Louis & Cairo Short Line.

Chippewa River & Menomee.—Work will begin next week on a standard gauge extension of this road north about 12 miles from Big Bend, Chippewa County, Wis.

Choctaw Railroad & Coal.—The company has been voted right of way and sites for its depots and shops, and $35,000, in Dallas, Tex., and it is stated that work will commence in about 60 days.

Cincinnati, Sandusky & Cleveland.—It is announced that the company will issue $3,000,000 first consolidated five per cent. 40 year mortgage gold bonds, with which to retire the present preferred stock and bonded debt and raise funds for other purposes.

Cleveland & Canton.—It is stated that the locating survey is being made for the extension south from Coshocton to Zanesville.

Cleveland & Mahoning Valley.—Winslow, Lanier & Co., of New York, offer for subscription at 107½ and accrued interest $1,500,000 of the five per cent. 50 year new consolidated mortgage bonds, recently issued.

Cleveland, Mt. Vernon & Delaware.—Wertheim & Gompertz, of Amsterdam, Holland, have commenced a suit in Akron, O., against the Pennsylvania and stockholders of the above road for the recovery of about $2,500,000 first mortgage bonds issued by the Cleveland, Mt. Vernon & Delaware, while it was under control of the Pennsylvania Co. This road was sold in 1881, and is now known as the Cleveland, Akron & Columbus, but the latter company is not made a party to the suit.

Covington & Macon.—Tracklaying from Madison to Athens, Ga., has been completed to a point about 13 miles from Madison, and will probably reach Athens early in July.

Duluth & Iron Range.—Tracklaying on the extension from Tower to Chandler Mine, Minn., 21 miles, has been completed and the line will probably be opened for traffic July 1.

Evansville & Richmond.—Grading will, it is stated, be commenced soon on this road, which it is proposed to build from Elnora, on the Evansville & Terre Haute, to Richmond, in Wayne County. The road must be completed by Jan. 1, 1889, to secure the aid voted.

Georgia Pacific.—The contracts for constructing that part of the extension between Columbus and Winona, Miss., 78 miles, were let last week to the following contractors: McLaughlin Bros., Rome, Ga.; Gibson & Coping, West Point, Miss.; James Sullivan & Son, Selma, Ala.; Coping Bros., Rome, Ga.; William Ferguson & Co., Rome, Ga.; John Inman, Troy, Tenn., and Dunn Bros., Birmingham, Ala. No contract exceeding 12 miles was let to one firm, and work is to be completed by Dec. 1, 1888. Construction begin at once at various other points along the line, and will be pushed rapidly to completion.

The contract for supplying 120,000 ties to be used on the extension has been let to Julian Bros., of Mississippi. Contracts for a similar number will be let soon.

Georgia Southern & Florida.—The grading was completed into the corporate limits of Valdosta, Ga., last week.

Jacksonville Southeastern.—The extension from Drivers eastward, five miles to Mt. Vernon, Ill., has been completed and opened for business.

Kansas City, Monett & Southern.—What is thought to be the locating survey for this road has been commenced at Monett, Mo., and will be completed to Kansas City as soon as possible. F. W. Bond, Monett, Mo., is Chief Engineer.

Kansas City & Pacific.—The extension from Selma to Paoli, Kan., has been completed to Vance, about four miles north of Selma.

Kentucky Union.—The contract for constructing 21 miles of the extension eastward from Clay City, Ky., has been let to Mason & Ford, and work will probably be commenced at once.

Leesburg & Lake Region.—The preliminary survey for this new Florida road is now being made. W. D. Barrett is President and C. S. Noble, Chief-Engineer.

Louisville & Nashville.—The Gate City Branch, extending from Boyles to Gate City, Ala., a distance of six miles, has been turned over to the operating department. It is laid with 60-lb. steel rail, with 3,000 oak ties to the mile, and was built under the supervision of principal assistant engineer B. F. Dickson and resident engineer L. S. Fitzhugh.

Manhattan (Elevated).—A quarterly dividend of 1 per cent. was declared this week, reducing the annual rate from 6 to 4 per cent. The reason assigned for the reduction is that it has been decided to devote the balance of the net earnings, after the payment of the dividend, to the payment of claims for damages to real property, instead of issuing new mortgage bonds. The business for the quarter was the largest in the history of the company. The net earnings, after the payment of fixed charges, were equal to 2.27 per cent. on the capital stock of $23,000,000. The statement, as compared with the same quarter last year, is as follows:

	1888.	1887.
Gross earnings	$2,270,874	$2,122,559
Operating expenses	1,170,028	1,149,488
Net earnings	$1,100,246	$973,071

The interest and rentals amounted to $387,947, and the structure and personal taxes to $121,893, leaving a balance applicable to the payment of dividends of $590,406. Last year there was $456,612 applicable to dividends, equal to 1.75 per cent. on the capital stock, from which a dividend of 1½ per cent. was declared. The change in policy was the occasion for a sharp decline in the stock, but when the business was understood to show no falling off there was a partial recovery.

Manitoba & Northwestern.—The branch being built from Langenburg to Sterling, Can., about 25 miles, is expected to be completed by Aug. 15. P. D. Mann, Winnipeg, Man., is the contractor.

Mason City & Fort Dodge.—The company propose to build a number of short branches to develop new coal fields near Lehigh, Ia.

Memphis, Oxford & Columbus.—The election held in Columbus, Miss., June 12, on the question to subscribe $80,000 to the road, resulted in an almost unanimous vote in favor of the subscription.

Mexican Pacific Coast.—Articles of association filed in New York to construct a road from the city of Tepic, in the state of Jalisco, Mexico, northeasterly through San Rosario, Mazatlan, Culiacan, and Sinaloa, in the state of Sonora, with a branch to Topolobampo Bay, with a line of boats to run from Topolobampo Bay and Mazatlan to points on the Gulf of California.

Missouri, Kansas & Texas.—Judge Brewer has fixed July 1 as the date to hear arguments for the appointment of a receiver. The application is made in the name of the Mercantile Trust Co., of New York.

Montgomery & Florida.—In the United States Court at Montgomery, Ala., in the case of the American Loan and Trust Co., of New York, against the road, Judge Bruce this week rendered a decree ordering the sale of the road on July 1 in Montgomery. The debt amounts to $102,000. The road is at present in operation from Montgomery, Ala., south 45 miles to Live Oak.

Nashville, Chattanooga & St. Louis.—The block system has been put in operation between Chattanooga, Tenn., and Wauhatchie, six miles. The Alabama & Great Southern and the Memphis & Charleston use the tracks of this road between Chattanooga and Wauhatchie.

Nebraska Southern.—It is stated that the engineers have arrived at Superior, Neb., and will immediately commence the survey for the line from Superior.

Nebraska & Southwestern.—Incorporated in Kansas to construct a road beginning at a point in Smith County, on the boundary line between Kansas and Nebraska, thence through the counties of Graham, Rooks, Osborne, Gore, Trego, Ellis, Russell, Lane, Ness, Rush, Garfield, Hodgeman and Finney to Garden City, with a branch to Dodge City, in Ford County. The estimated length of the road and branches is about 500 miles. The capital stock is $5,000,000.

Ohio, Indiana & Western.—The company has awarded the contract for erecting a new freight depot in Indianapolis to Thomas Morris, of that city. The building is to be of brick, on stone foundations, and 320 feet long by 70 feet wide, and will cost about $30,000.

Olympia, Black River & Chehalis.—Incorporated in Washington Territory to build a road from a point near Olympia, down Black River to its intersection with the Chehalis River, and thence to a point near Elma, in Chehalis County; also from a point on this line near Black Lake northerly to a point in Thurston County. The capital stock is $500,000. The survey is now being made.

Oregon Railway Extension Co.—Incorporated to build the following lines of railroad: From Alto, Wash. Ter., via Estes to Wallula, and from Estes to Riparia, W. T.; from Texas Ferry via Pleasant Valley to Dutch Flat (63 miles from Palouse Junction), thence easterly to a junction with the Washington & Idaho road at a point five miles north of Farmington, W. T.; also from Portland to Astoria, Ore., and from some point on this line to Forest Grove, Ore.

Paris, Choctaw & Little Rock.—The engineers are now in the fields surveying the line for this road, which it is proposed to build from Paris, Tex., to Hot Springs and Little Rock, Ark.

Pemberton & Hightstown.—The Union Transportation & Construction Co. has been organized by citizens along the line, to lease the road from the Pennsylvania and operate it for a term of years, with the privilege of renewal.

Pensacola & Memphis.—Grading was commenced on this road at Pensacola, Fla., last week with a force of 27 graders, which is said will soon be largely increased.

Philadelphia & Reading.—The company announces that, as provided for in the reorganization plan, the principal of the old general mortgage bonds, with interest accrued and unpaid to July 1, 1888, will be purchased in cash on and after June 30, at the office of Drexel & Co., Philadelphia, after which date interest on the bonds will cease. Drexel & Co announce that they will be prepared to receive their certificates of 6 and 7 per cent. general mortgage bonds on and after June 25.

The Reading Co. also announces that the principal of all outstanding sterling scrip, with interest to July 1, 1888, will be paid on July 2 by Drexel & Co., Philadelphia, after which date interest will cease.

Poughkeepsie Bridge Railroad Co.—Incorporated in New York to build a road from a line on the Poughkeepsie Bridge easterly two miles to a point beyond the line of the New York & Massachusetts railroad, and also southeasterly 2¼ miles, to connect with the same road. The capital stock is $50,000.

Russell & Southeastern.—Incorporated in Kansas to construct a road from Russell, on the Union Pacific, southeast through the counties of Russell, Barton, Ellsworth, Rice and Reno, to Hutchinson, an estimated distance of 81 miles. The capital stock is $500,000, and the principal office is to be in Russell.

Salt Lake & Fort Douglas.—The road has been completed from Salt Lake City easterly to Fort Douglas, Utah Territory, and opened for traffic.

San Francisco & North Pacific.—A force of about 600 is at work on the extension north 30 miles to Ukiah, Cal., and is within 11 miles of Ukiah. The heading in the Larrison tunnel met June 2. This tunnel is the longest one on the route, being 1,750 ft. But one of the five tunnels now remains uncompleted.

Seattle, Lake Shore & Eastern.—The directors have approved the map of the locating survey from Spokane Falls, Wash. Ter., eastward to the western boundary of Idaho, a distance of 51 miles, and ordered it to be sent to the Secretary of the Interior. The map showing the preliminary survey to Clearwater River, a distance of 128 miles, has also been approved.

Sheffield & Birmingham.—An extension of the road from Jasper, Ala., about eight miles to a point on the Georgia Pacific, is under consideration.

South Pennsylvania.—A commission has been appointed to take evidence in the suit of the Pennsylvania to prevent certain stockholders of the South Pennsylvania from selling their stock or otherwise acting as if they were its owners, the plaintiffs claiming that under the West Shore deal of 1885 the defendants sold all their interest in the South Pennsylvania. In the answers which were filed last December, the defendants allege that the contract of sale was never consummated or ratified, and they claim the right to sell the stock or to proceed with the construction of the road as they see fit. A hearing will be held in New York today, but it has been agreed to postpone proceedings till autumn.

Tavares, Orlando & Atlantic.—A receiver has been asked for in the United States Court at Jacksonville, Fla., the road having defaulted on its bonds. It is in operation between Tavares and Orlando, Fla., 32 miles.

Toledo, Ann Arbor & North Michigan.—Charles M. Whitney & Co. offer to investors, at par and accrued interest, the entire interest of $1,260,000 "Cadillac extension" six per cent. 30-year gold bonds, which are secured by a first mortgage and are limited to $19,800 per mile. When the extension to Franklin, Mich., has been completed, the company will control a line from Lake Erie to Lake Michigan.

Toledo, Saginaw & Muskegon.—It is stated that the Grand Trunk has secured control of this road.

Union Pacific.—When the Railroad Commissioners of Nebraska last fall ordered a large reduction in local rates throughout that state, the Union Pacific secured an injunction to prevent the reduced rates going into effect on that road, claiming that the company was not subject to state control, having been built under a charter from Congress. The road having, however, acquired some $3,000,000 worth of property in the state by exercising the right of eminent domain, the Attorney-General of the state instituted quo-warranto proceedings to declare this property forfeited to the state, on the ground that the road was a foreign corporation. This seems to have compelled the road to acknowledge the authority of the state, as the injunction suit against the Railroad Commissioners has been dropped. The order of the Commissioners, reducing rates, which has never been complied with by this road, will, it is said, now be renewed.

Wabash.—The Harriman and Hartshorn committee of second mortgage bondholders has settled with the committee and turned in all the bonds which the committee held, about half a million. This gives the purchasing committee about $23,000,000 out of an entire issue of $28,000,000 and practically removes the last obstacle in the way of reorganization, since the cost of litigation would bear very heavily on the small amount of bonds still objecting. The committee has decided to waive the penalties on these bonds, and also to refund all money paid for penalties by other bondholders.

Warrior Coal Fields.—At the election in Memphis, Tenn., June 12, the proposition to subscribe $110,000 to the road was approved by a large majority.

Washington & Idaho.—Grading on this road was commenced June 1 at Farmington, W. T., and it is thought that it will be completed to the Cœur d'Alene mines by early fall.

Wisconsin Central.—The company has filed in Wisconsin resolutions providing for short branches on the Penokee road to different mines.

TRAFFIC AND EARNINGS.

The Inter-state Commission.

The Inter-state Commerce Commission met in New York City Wednesday morning, June, 13, to hear the case of the Produce Exchange against the trunk line railroads. The Produce Exchange seeks the aid of the Commission to prevent the roads from charging a greater rate on grain and merchandise destined to New York proper than the proportion of the through rate on export freight which they accept. All of the commissioners were present. The railroads against which the action is directed are the New York Central & Hudson River, the Michigan Central, the Lake Shore & Michigan Southern, the Chicago & Grand Trunk, the New York, Lake Erie & Western, the Chicago & Atlantic, the New York, Pennsylvania & Ohio, the New York, Chicago & St. Louis, the West Shore, the Delaware, Lackawanna & Western, the Grand Trunk of Canada, the Pittsburgh, Fort Wayne & Chicago, the Pennsylvania, the Pittsburgh, Cincinnati & St. Louis, the Wabash Western, the Baltimore & Ohio, the Philadelphia & Reading, and the Central of New Jersey.

Mr. J. D. Kernan, who was some years Railroad Commissioner of the state of New York, is one of the counsel for the Produce Exchange.

The first witness was Commissioner Albert Fink. He explained that from July 1, 1877, till the present time, except between Nov. 4, 1887, and Feb. 20, 1888, the rule was to make European rates by adding the ocean to the rail rate; but he did not deny that this rule had been broken. The Pennsylvania denied that it had taken any export freight to New York at a rate lower than that charged on domestic shipments. Mr. Fink had "long since given up the idea that there is any kind of agreement that cannot be evaded." One way of cutting, he said, was as follows:

"A railroad agent would advertise a certain rate, and then would say to a dealer: 'I will bet you $10 you won't ship over my line.' The dealer would take the bet, ship the freight, and practically secure a rebate of $10."

Jacob H. Herrick, chairman of the Produce Exchange Committee, testified as to the effect of railroad discrimination, as follows:

It practically prohibits during six months of the year any export business direct from New York, because on the basis of a cheaper through rate to a foreign port than to New York, the grain is moved in the winter season direct to these foreign ports and the grain thus sent forward goes a long way toward fixing the price of the accumulated stocks in New York during the period of open navigation; so that the grain sent forward on through rates affects the price of every bushel of grain in the city of New York.

S. S. Marples, exporter of provisions, said that the through freight discrimination had acted injuriously on his business.

The hearing is in progress as we go to press.

Traffic Notes.

Pig-iron is now being taken from Birmingham, Ala., to Louisville and Cincinnati at $2.40 per ton. The distance to Cincinnati is 478 miles, and the rate lately has been $2.90 per ton. The southern roads have for some time aimed to make rates on pig-iron variable in proportion to the fluctuations in the price of that commodity in the market.

Rates on pig iron between New York and Chicago have been reduced from 25 cents to 20 cents per 100 lbs., and between other trunk line points in proportion.

The Minneapolis & St. Louis has withdrawn from the Western States Passenger Association.

The Central Traffic Association has requested the Lake lines to become members of the weighing and inspection bureaus at Chicago, Milwaukee, Buffalo, Erie and other points.

Pittsburgh dispatches report that round trip tickets from that city to Chicago for the Presidential convention are being sold for $5 each. The same rate is quoted by the three smaller lines from Minneapolis.

The rate on dressed beef between Missouri River points and Chicago is 28.65 cents per 100 lbs.

Freight rates from New York and Boston to Colorado points via steamer to New Orleans and thence by the Fort Worth & Denver have been reduced to a basis of $1.98 first class (from $2.20).

The Wisconsin Central has reduced its through freight rates between St. Paul and Chicago to a level with those of the Chicago, St. Paul & Kansas City.

Coal.

The coal and coke tonnage of the Pennsylvania originating on lines east of Pittsburgh and Erie, for the week ending June 2 and the year to that date was as follows:

	Coal.	Coke.	Total.
Total for week ending June 2, 1888	174 932	76.651	251.583
Total for year 1888 to date	4,903,719	1,652,079	6,555 798
Total for year 1887 to date	4.409.710	1,552,994	5.962,704

On the United Railroads of New Jersey Division the anthracite coal tonnage of the Belvidere Division for the same periods was as follows:

	1888.	1887.	Inc. or Dec.
Week ending June 2	27.194	24,034	I 3.159
Year to June 2	649,320	753,244	D. 103,923

The coal tonnages for the week ending June 9 are reported as follows:

	1888.	1887.	Inc. or Dec.	P. c
Anthracite	556 891	697,546	D. 140.655	20.1
Bituminous	308,415	383,836	I. 24,579	8.5

The Cumberland coal trade for the week ending June 9 amounted to 67,576 tons, and for the year to that date 1,508,740 tons.

Railroad Earnings.

The earnings and expenses of the Chicago & Northwestern for the year ending March 31 are as below:

	1888.	1887.	1886.
Gross earnings	$26,697,105	$26 321,316	$24.279,600
Oper. expenses	16,754,486	15.070 342	13 859,226
Net earnings	$9,942,619	$11,250,974	$10.420,374
Interest	5,244,428	5,136,198	5,536,363
Dividends	3,444.504	3,444 504	3,444,504
Miscellaneous	58,000	58.000	58,000
Total	$8,746,932	$8,638,702	$9,038,867
Surplus	1 195,687	2,612,272	1,381.507
Div. ends, pref	7	7	7
Dividends, com	6	6	6
TRANS-MISSOURI RIVER LINES.			
Surplus	$172,220	$52,002	$92,571
Net land receipts	467,884	689,588	872,249
Total surplus	$1,835,791	$3,353 862	$2,346,327

The following report of the earnings and expenses of the Chicago, Rock Island & Pacific for the year ending March 31 was presented at the annual meeting. The statement with that of the two previous years being compared:

	1888.	1887.	1886.
Gross	$13,509,727	$12,313,050	$12,004,348
Oper. expenses	8,742,659	7.504,809	7,166,893
Net	$4,767.667	$4,808,241	$4 837,455
Land sales	220,000	230,000	310.000
Total	$4 987,667	$5,038,241	$5,147,455
Pro. roads	193,170		
Total	$5,180,837	$5,038,241	$5,147,455
Prem 5 p. c. bonds	844,000		
Total	$6,024.837	$5,038,241	$5,147.455
All charges	2 428,566	1,795.351	*2,143,029
Balances	$3.596.271	$3,242,890	$3,004,426
Div. 7 per cent	3,010,566	2,937,186	2,937.186
Surplus	$585,705	$305,704	$67,240
Cap stock	46,156,000	41.960.000	41.960 000
B'nd'd debt	41,468,000	29 360.000	21,46 ,000

* Includes $463,000 improvements

The passenger earnings were $3,487,501, an increase of $391,585 over those of the previous year, and the freight earnings were $8,801,353, an increase of $763,901.

The statement of earnings and expenses of the Chicago, Burlington & Northern for April and the first four months of the year is given as follows:

Month of April:	1888.	1887.		Decrease.
Gross earnings	$127,987	$207,742	D.	$79,755
Oper. expenses	130,767	187,820	D.	57.053
Deficit	$2.780	Net $19,922	D	$22,702
Four months—Jan. 1 to April 30:				
Gross earnings	$475,268	$829,243	D.	$353 975
Oper. expenses	477,967	623,478	D.	145,511
Deficit	$2.699	Net $205,765	D.	$208,464

Earnings of railroad lines for various periods are reported as follows:

Month of April:	1888.	1887.	Inc. or Dec.	P c.
Atch., T. & S. Fe.	$1,205,370	$1.684,358	D. $479,008	28.5
Net	240,605	788 402	D. 547 797	69.4
Central of N. J.	1,006,326	987,349	I. 18,977	1.8
Net	451,513	483,354	D. 31 841	6.4
Ches., O. & S. W.	140,917	127,364	I. 13,553	10.2
Net	45.105	37.163	I. 7.942	29.0
Chi., Bur. & No.	127.987	207.742	D. 79.755	38.1
Net	Def. 2 780	19 922	D. 22.702	115.8
Chi., Bur. & Q.	1,703,844	2,197,899	D. 494,055	22.5
Net	154 681	910,.31	D. 755,450	82.8
C., C., C. & I.	567.778	565,7 3	I. 2,045	0.3
Net	141,829	128,946	I. 12,883	9 4
Georgia Pacific.	94,372	85,571	I. 8.801	9 4
Net	27.091	28.871	D. 1,780	3.6
Minn. & St. L.	102,416	113.552	D. 11,136	9.7
Net	21,906	14, 19	I. 7,687	50.0
New Brunswick.	77,9 4	73.567	I. 4,367	5 5
Net	27.198	27.082	I. 116	0.4
Ohio River	33.181	20,864	I. 12.317	60.0
Net	13.3 8	5.926	I. 7,402	140.0
Ore. Imp Co. Net.	129.297	77,774	I. 51,523	66.2
Oreg. R. & N. Co.	478,053	437,548	I. 40,505	9.1
Net	141,273	175,184	D. 33 911	18.8
Scioto Valley	48,869	53.687	D. 4,818	7.5
Net	6,714			
Sou hern Pac. Co.:				
Gal., H. & S. A.	316,094	276.943	I. 39,151	14.1
Net	82,457	20,102	I. 62,355	31 0
Louis & West.	75,960	61.512	I. 14,448	23.0
Net	37,149	20 911	I. 16.238	80.0
Mor. L.& Texas.	413,022	316,894	I. 96, 28	30 4
Net	100,994	53,936	I. 5?,058	100.0
N. Y., Tex. & M.	8,655	15.648	D. 6,993	40.0
Net	Def. 4,422	1,.94	D. 6,1 6	600.0
Tex & New Orl.	110,820	95.597	I. 15.223	15 8
Net	29,275	31,588	D. 2,313	6.4
Total A'l. Sys.	924,551	766 594	I. 157,957	20 5
Net	251,453	128,232	I. 123,221	96.1
Tol. & Ohio Cent.	83,761	73 203	I. 10 408	13.7
Net	28,317	18,9 9	I. 9 318	50.0
Union Pacific	2,539,743	2,342,155	I. 197,088	8 4
Net	1,116,683	846,350	I. 270,333	31.9
Total (gross)	$10,059,133	$10,503,840	D. 444.707	4 2
Total (net)	3.038,952	3,818,786	D. 779,834	20.4
Four months—Jan. 1 to April 30:				
Atch., T. & S. Fe.	$4,579,194	$5,996.040	D. $1,416,846	23.6
Net	1,2 1,.68	2,833,750	D. 1,632,582	57.6
Cairo, V. & C.	220.537	222,052	D. 1,515	0.5
Net	53.546	43.539	I. 10,007	23.2
Central of N. J.	3,678,7 4	3,373,843	I. 504,881	9.0
Net	1,538,131	1,436,435	I. 101,696	7 0
Ches., O. & S. W.	618,068	549 909	I. 68 099	12.4
Net	195,273	197,114	D. 1,841	0.5
Chic., Burl. & N.	475 269	8 9,245	D. 353,976	42 6
Net	Def. 2,899	205.765	D. 208,464	101.4
Ci., C., C. & I.	2,307,626	2,328.629	D. 21,003	0.8
Net	566,513	684,231	D. 117,718	17.1
Georgia Pacific.	410,971	351,862	I. 65,109	18.5
Net	90,282	103,787	D. 13, 05	12.6
Minn. & St. L.	398,411	496,834	D. 98,4?3	19.7
Net	61,553	117,669	D. 56.116	47.8
New Brunswick.	253,537	235.529	I. 18,008	7.7
Net	67,196	35,411	I. 31.785	88.6
Ohio River	114,139	72,579	I. 41, 60	56.8
Net	42,208	19,7 5	I. 22,483	115.7
Ore Imp. Co. Net.	360,635	212, 99	I. 88,236	41.5
Oreg. R. & N. Co.	1,754 631	1,409.750	I. 344,881	24.4
Net	535,724	471,389	I. 64,335	13.6
Scioto Valley	257.757	231,789	D. 24,032	10.4
Net	37,168			
Southern Pacific:				
Gal., H. & S. A.	1,255,064	975,183	I. 279 881	28.6
Net	304 983	28,100	I. 276.883	985 7
Louisiana West	303,584	242,?77	I. 60.507	24.8
Net	146,067	9 ,200	I. 48,768	49.5
Morgan's L. & T.	1,784 462	1.314,848	I. 469,614	35.7
Net	543,944	150,7 6	I. 393 238	262 0
N. Y., Tex. & M.	32,092	47,527	D. 15,435	32 0
Net	Def. 22,990	Def. 6,442	I. 16,548	266.6
Tex. & N. Orl'ns.	451,071	362,584	I. 88,487	24.3
Net	123,156	139,888	D. 16,732	11.5
Total At. Sys.	3 826,069	2,943,017	I. 883,052	30.0
Net	1,095,159	409 552	I. 685 607	167 4
Tol. & Ohio Cent.	374,889	315,790	I. 59,099	18.7
Net	139, 11	111,014	I. 28,197	25.2
Union Pacific	8,698 120	8,326 787	I. 371 333	4 4
Net	3,170,911	2,8 6,080	I. 354,831	12 5
Total (gross)	$31,750,015	$30,626,734	I. $1,123,281	3.6
Total (net)	10,152,670	10,071,406	I. 81,264	0.8
Month of March:				
Central Pacific	$1,228.948	$1,115,960	I. $112 988	10.0
Net	470.788	505,300	D. 34,512	6 5
Ci., C., C. & I.	642,334	6 5,794	D. 43,460	6.3
Net	185.050	257,490	D. 72,440	28.0
Oregon Imp. Co.	466.440	299,916	I. 166,524	55 5
Net	66.652	73,707	D. 7,055	9.6
Southern Pacific:				
No. Div. (Cal.)	138,910	141,261	D. 2,351	1.4
Net	55,865	58,162	D. 2,297	3.4
So. Div. (Cal.)	589.049	255,763	I. 333,286	130 6
Net	177,931	19,971	I. 157 960	826.5
Ariz. Div.	204.750	171,948	I. 32,802	18.7
Net	96,471	80,992	D. 14,521	17.5
New Mex. Div.	102,333	74,636	I. 27,697	36.2
Net	33,614	35,486	D. 1,872	2.8
Three months—Jan. 1 to March 31:				
Central Pacific.	$3.414.242	$2,635,363	I. $778,879	29.5
Net	1,269,904	1,061,043	I. 208 860	19.6
C., C. C. & I.	1,739,848	1,7?9,896	D. 23.048	1.3
Net	424 683	555,285	D. 130,602	23.4
Ore. Imp. Co	1,194 064	795,857	I. 398,207	50 1
Net	171,238	134,624	I. 36,714	26 9
Southern Pacific:				
No. Div. (Cal.)	369,866	335,815	I. 34.051	10.1
Net	127.342	108,686	I. 18,656	16.6
So. Div. (Cal.)	1,547.821	799,254	I. 748,5?7	93 6
Net	431,959	174,346	I. 257,613	147.7
Arizona Div.	604.956	417 890	I. 187,066	44.8
Net	179.755	169,904	I. 9,851	5 3
New Mex. Div.	279.576	175,345	I. 104,231	59.4
Net	93,717	71,5?9	I. 22,208	31.0

Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

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